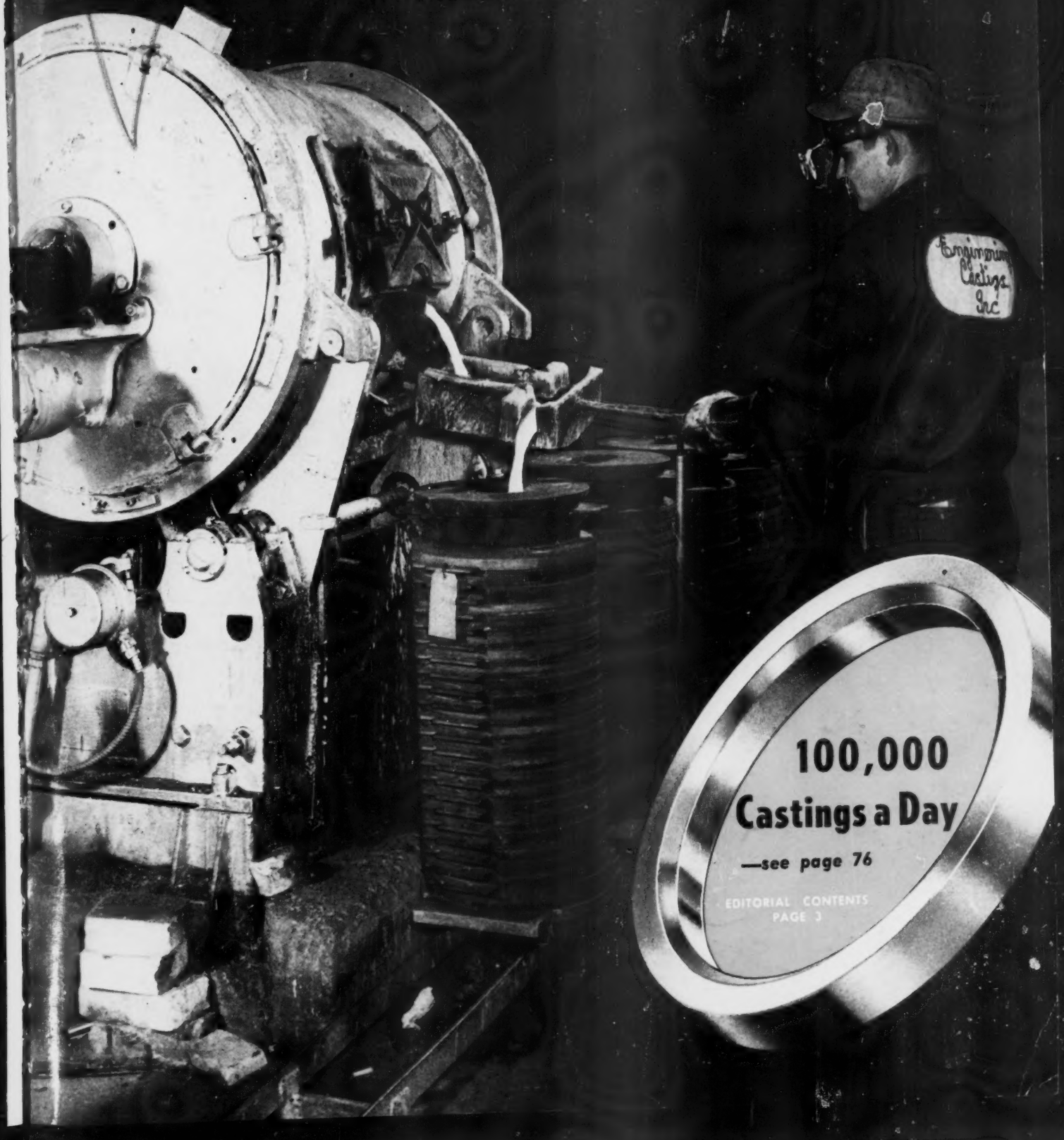
JANUARY 1952

FOUNDRY

WHEREVER METALS ARE CAST



100,000 Castings a Day

—see page 76

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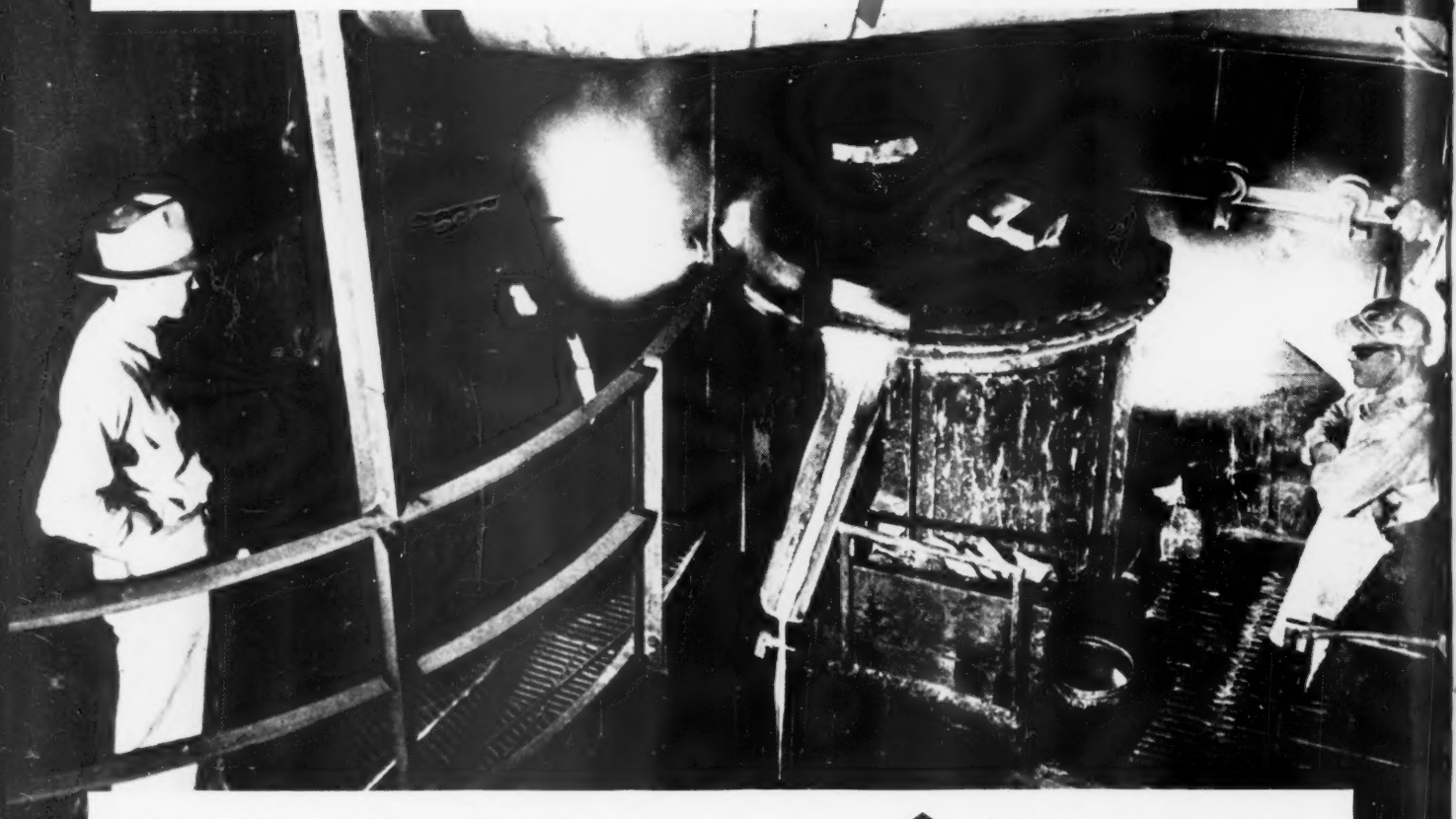
Foundries that specialize in Quality Castings flux and desulphurize with PURITE



A modern cupola and forehearth installation used in the manufacture of farm equipment parts and critical machine castings at the Lynchburg Foundry Company, Lynchburg Plant.

Lynchburg Foundry Company—long famed for casting quality farm equipment parts, castings for the chemical industry, critical machine parts and iron pipe—relies on Purite to give increased fluxing action in cupolas and to reduce sulphur in ladle or forehearth.

Here's why so many leading foundries use Purite:

- Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
- Purite gets to the iron quicker—no faster desulphurizer made.
- Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
- Purite comes in 2-lb. pigs—no weighing or measuring required.
- Purite is 100% fused soda ash—you do not pay for inert materials.
- Purite does not crumble—no waste—no dust.
- Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

PURITE TRADE MARK is sold by all leading foundry supply houses in the United States and Canada.

Nearly 30 years of successful experience prove why Purite is today's outstanding flux and desulphurizer. Get full information on Purite's effectiveness—write today for new booklet, "Refining and Desulphurizing in the Cupola." Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE 100% fused soda ash.

The Scientific Flux for Better Melting and Cleaner Iron.

Mathieson CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

FOR FASTER, EASIER, LOWER COST FINISHING OF GRAY IRON CASTINGS

'NISILOY'*

(NICKEL-SILICON-ALLOY)

• WHAT IT IS

"NISILOY" is an inoculant with positive graphitizing power. It contains about 60% nickel, 30% silicon, balance essentially iron. Its remarkably low melting point of 1800° F. and relatively high specific gravity causes it to dissolve quickly in liquid iron.

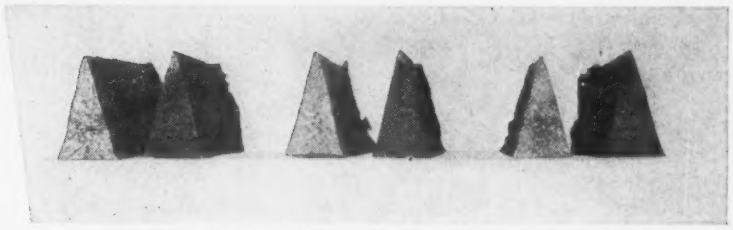
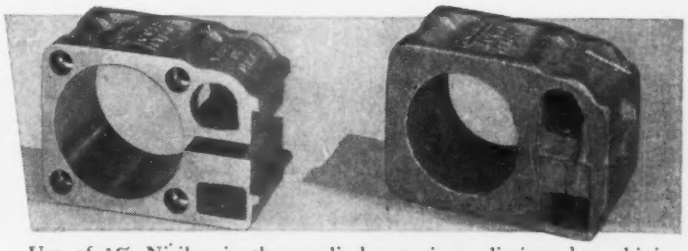


Photo of 1" chill test bars show advantages of Nisiloy. In each pair, wedge on left is white, and was cast without Nisiloy. Right hand wedges used progressively 1 to 1½% Nisiloy. Notice complete elimination of hard white iron on specimen at extreme right.

• WHAT IT DOES

"NISILOY" improves machinability . . . it provides a dense, gray, easy-to-machine structure that reduces machine shop costs.

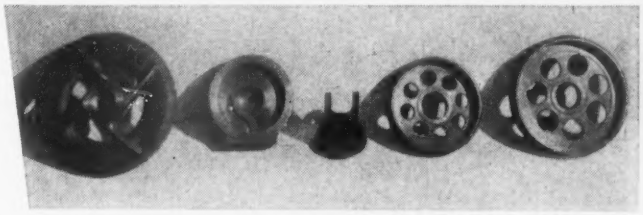


Use of 1% Nisiloy in these cylinder castings eliminated machining troubles from hard spots in light sections, raised output, reduced rejects and cut final costs.

• HOW TO USE IT

"NISILOY" is simply added to the ladle. Additions of from .25 per cent to 1.00 per cent usually prove sufficient for structure control. Improve quality and quantity of your output. Get full information . . . mail the coupon now.

*Trade Mark of The International Nickel Company, Inc.



Nisiloy helps you control properties of gray iron for casting parts with varied cross sections that tend to create chilled surface areas. Its use eliminated machining troubles, and provided a dense, uniform close-grained microstructure in these bonnets, slide valves and bushing.

EMBLEM OF INCO SERVICE
TRADE MARK

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering alloys for many end uses in defense and defense-supporting industries.

THE INTERNATIONAL NICKEL COMPANY, INC.
Dept. TF, 67 Wall Street, New York 5, N. Y.

Please send me your booklet entitled, "NISILOY" for GRAY IRON CASTINGS.

Name..... Title.....

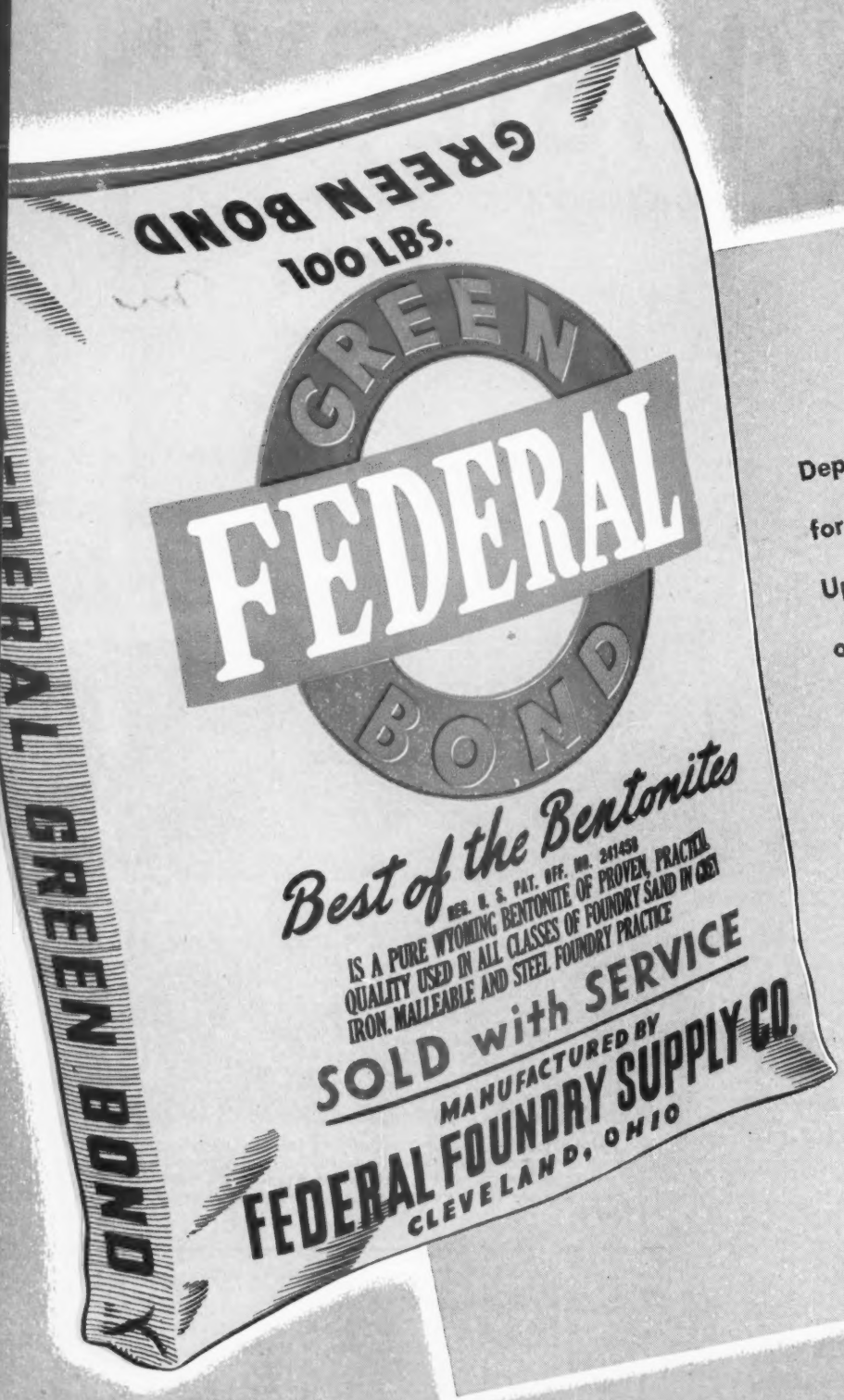
Company.....

Address.....

City..... State.....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

STILL THE *Best* OF THE BENTONITES!


GREEN BOND
100 LBS.
GREEN
FEDERAL
BOND
Best of the Bentonites
REG. U. S. PAT. OFF. NO. 241458
IS A PURE WYOMING BENTONITE OF PROVEN, PRACTICAL QUALITY USED IN ALL CLASSES OF FOUNDRY SAND IN GREY IRON, MALLEABLE AND STEEL FOUNDRY PRACTICE
SOLD with SERVICE
MANUFACTURED BY
FEDERAL FOUNDRY SUPPLY CO.
CLEVELAND, OHIO
GREEN BOND
GREEN BOND

Deposits of the finest Bentonite clay for foundry use are located near Upton, Wyoming. Here, on Federal-owned property, GREEN BOND is mined, dried and pulverized, to produce bonding clay of the finest quality and uniformity. From the very beginning, GREEN BOND has been the best of the Bentonites!

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CANADA—Overseas Commodities Ltd., 2845 Grandview Hgy., Vancouver, B.C. • T. D. Barnes, 59 Sun Life Bldg., Hamilton, Ont. • Newman Foundry Supply, Ltd., 643 St. Paul St. W., Montreal, Que. European Concessionaires: The District Chemical Company, Ltd., 1-19 New Oxford St., London W. C. 1, England.

JANUARY 1952

FOUNDRY

VOLUME 80—NUMBER 1

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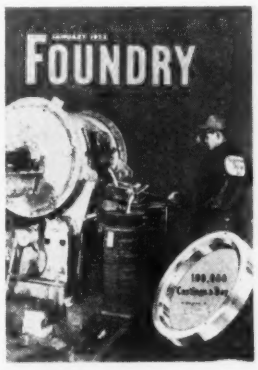

THE COVER: Direct pouring from furnace to mold helps facilitate production of 100,000 castings a day at Engineering Castings Inc., Marshall, Mich. See page 76

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INDUCTOL has been proved

in 50 production foundries where baking problems had existed. If you have a special baking problem, ask your LINOIL *man about* INDUCTOL *—he'll be happy to arrange for a demonstration.*

HAVE YOU A BAKING PROBLEM THAT ORDINARY CORE OILS CAN'T SOLVE?

INDUCTOL ...the New, "Pre-baked" Core Oil!

WANT CORES TO BAKE FASTER?

Are your core ovens a bottleneck for your foundry? The quickest way to increase oven capacity is to cut down on the time a core occupies oven space. INDUCTOL allows you to do this, because INDUCTOL bakes rapidly—30 to 50% faster than even the fastest conventional core oils. Some foundries have doubled their core production by switching to INDUCTOL!

NEED TO BAKE AT 350°?

If, for example, you're casting magnesium, you have to bake cores at temperatures that won't drive off the inhibitors. INDUCTOL can bake at 350°—bake thoroughly and quickly. This lower baking range of INDUCTOL is good for many coke-fired ovens or for over-night baking, too!

LOOKING FOR BETTER COLLAPSIBILITY?

INDUCTOL is specially right for non-ferrous and malleable iron work—where quick collapsibility is a must. Because INDUCTOL bakes so rapidly, it burns out instantly at temperatures above 800°. Certain core rooms have found that they could eliminate the use of wood flour in their INDUCTOL cores.

★ INDUCTOL IS DIFFERENT—

a new product development of the LINOIL Research Laboratory. INDUCTOL is a chemically modified drying oil: during its manufacture, high pressure and temperature conditions serve to pre-polymerize the oil . . . essentially causing it to become "pre-baked". This pre-baked feature allows INDUCTOL to harden rapidly at temperatures between 350° and 450°.

INDUCTOL—BALANCED CORE ROOM PERFORMANCE

- ★ FASTER BAKING
- ★ ADDED GREEN STRENGTH
- ★ GOOD COLLAPSIBILITY

GET THE FACTS—send for your **INDUCTOL** *booklet today. It contains helpful information based on actual use in production.*

LINOIL

ASK YOUR LINOIL MAN ABOUT

INDUCTOL

ARCHER-DANIELS-MIDLAND COMPANY

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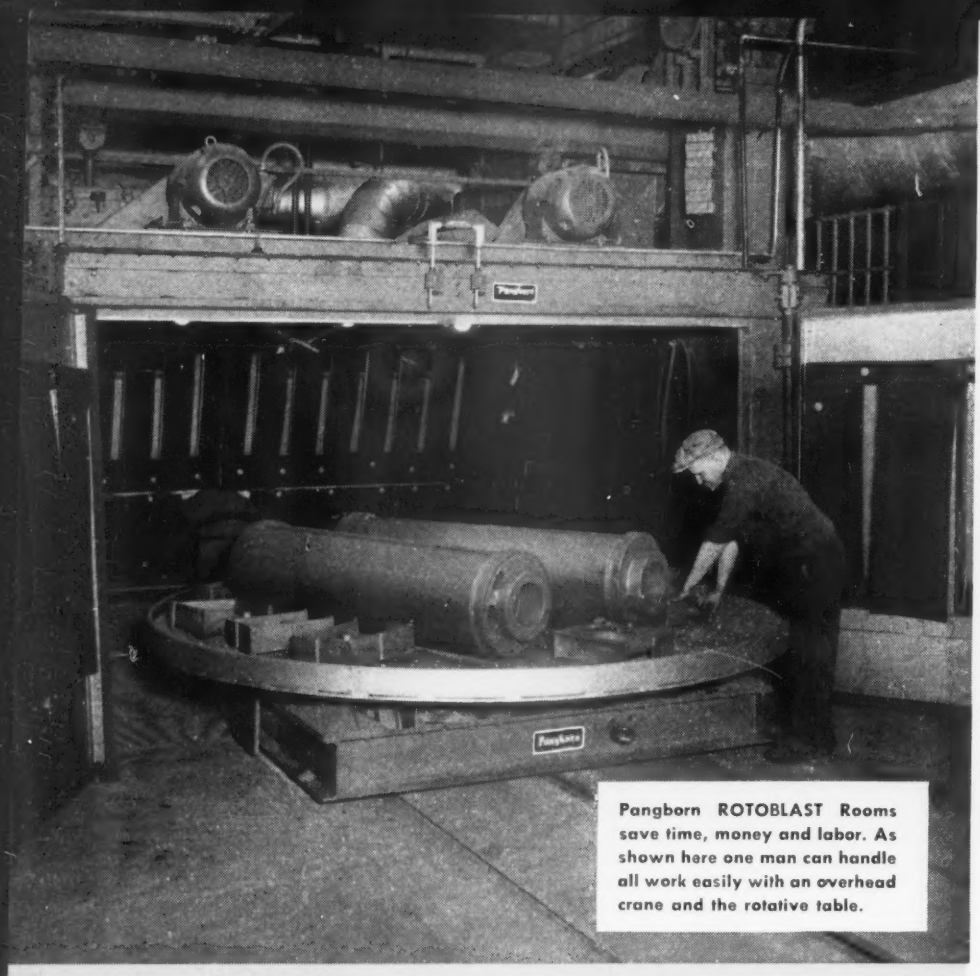


Pangborn ROTOBLAST Rooms save time, money and labor. As shown here one man can handle all work easily with an overhead crane and the rotative table.

CLEAN LARGE CASTINGS AT LOW COST

with Pangborn ROTOBLAST* Rooms

IF you clean large castings, investigate the economy and speed of modern Pangborn ROTOBLAST Rooms. They combine all the features of standard Pangborn Blast Cleaning Rooms with ROTOBLAST . . . the modern airless blast cleaning method developed by Pangborn that saves up to 87% on power alone!

You can specify any size, width, length or height required; work may be handled by monorail conveyor, hoist, movable car or rotative table (as shown above). Ceilings may be hinged for hoist or crane operation and roll-up doors are available. Operation is easy and simple because entire work area is flooded with light.

Only one man is needed for fast, efficient operation. One company* for example, reports savings of $10,160 on labor over their old-style room and has reduced their cleaning time by two-thirds.

More than 28,000 Pangborn machines serving industry.

(*Name on request)

WRITE FOR FULL INFORMATION. To get specific information on Pangborn ROTOBLAST Rooms, outline your problem in a letter. There is no obligation. Just tell us what you make, what you clean and how much you clean per day. Write today to: Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

If you haven't heard it . . . IT'S NEWS!

PROBLEM OF THE MONTH: why is the guy who has the least privacy of anybody in the world called a private???

* * *

FRIEND OF OURS BACK HOME who got drafted recently writes that the army offered him a commission but he turned it down; he's such a bad shot he figured he better work on a straight salary.

* * *

WHO SAYS YOU NEVER GET SOMETHING FOR NOTHING? Our hobby is disproving old adages. So here's a FREE OFFER of a handy gadget for engineers—or for anyone for that matter: a Desk Calculator which contains conversion factors, rules for calculation, measures of pressure, metric measurements, etc. Just send a postcard to W. F. Nigh, PANGBORN CORPORATION, Hagerstown, Md., and you get yours by return mail, no questions asked.

* * *

ONE THING IS FOR SURE: television isn't replacing radio half as fast as it is homework.

* * *

LOST—TAN LEATHER WALLET containing pictures, personal papers and $350 currency. Finder may keep pictures, personal papers and wallet but owner has sentimental attachment to the money.

* * *

AT TWENTY SOME MEN THINK they can save the world. At thirty they begin to wish they could save part of their salary.

* * *

A LARGE INDUSTRIAL CONCERN recently discovered that 9 out of 10 cases of workers' inefficiency were caused by worry. A life insurance company found that 4 out of 5 nervous breakdowns began not in actual events but in worry. A medical clinic says that 35% of all illness on its records started with worry. Draw your own conclusions but ours is that it's about time to stop worrying and start living.

* * *

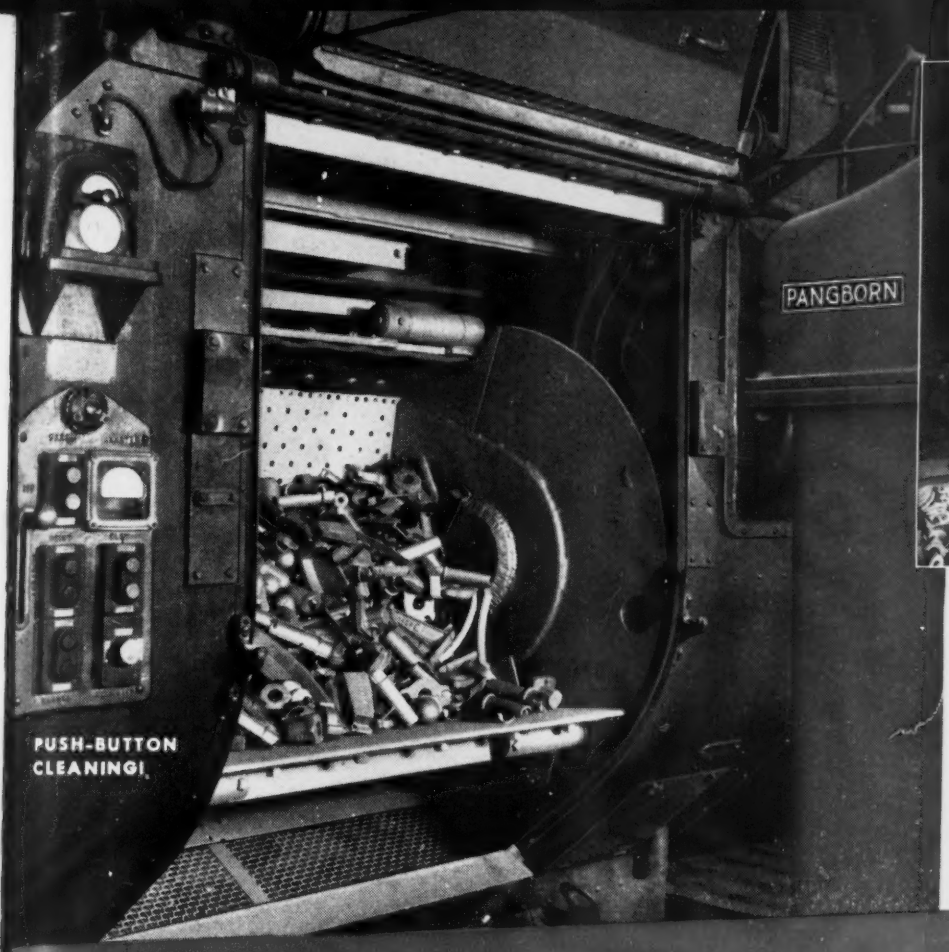
HERE AT PANGBORN we make no claims whatever about solving your personal worries. But we do make machines that dispel any business worries that you can trace to a pesky dust control problem or to bottlenecks or high labor costs in the cleaning room. Pangborn machines have solved these problems for years for industries the world over and can solve the same problems for you. Look into it today. No obligation.

* * *

WE'D BE A LITTLE MORE INCLINED to accept statistics if statisticians could produce 2.63 persons.

* * *

INFLATION NOTE: the other planets may not be able to support life, but it isn't exactly easy on this one either.



PUSH-BUTTON CLEANING!

MECHANIZED LOADING!

SIMPLIFIED UNLOADING!

Here's How Pangborn ROTOBLAST* Barrels SPEED DEFENSE PRODUCTION!

SPEED is essential to defense production . . . and in case after case, Pangborn ROTOBLAST Barrels have proved they can clean castings up to 24 times faster than conventional equipment. Even loading is fast! With Pangborn automatic loading equipment, any size ROTOBLAST Barrel (from 3½ to 28 cubic feet) can be loaded *in one minute or less!*

What's more, Pangborn ROTOBLAST Barrels assure high-quality cleaning. The exclusive "rocking" action of the Barrel exposes all surfaces to the blast stream . . . makes sure pockets of intricate pieces are completely cleaned. And ROTOBLAST Barrels cost less to operate. Horsepower requirements average 87% less, smaller crews are needed and automatic abrasive recovery assures maximum economy.

FOR FASTER BLAST CLEANING install Pangborn ROTOBLAST Barrels in your cleaning room. Bulletin 213 gives you full details, specifications and actual performance as reported by users. Write today to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

These action photographs prove Pangborn ROTOBLAST Barrels are *easy to operate*. This 14' ROTOBLAST Barrel is shown in use at the Frick Company. It speeds cleaning by replacing four old-style machines and a secondary pickling operation. And with this machine two men can clean half the entire foundry's output—at an annual saving of $2540.00 on labor!

ROTOBLAST . . .

SAVES LABOR with push-button operation

SAVES SPACE because machines are compact

SAVES TIME by cleaning more loads per day

SAVES POWER since no compressor is needed

SAVES TOOLS because all scale is removed

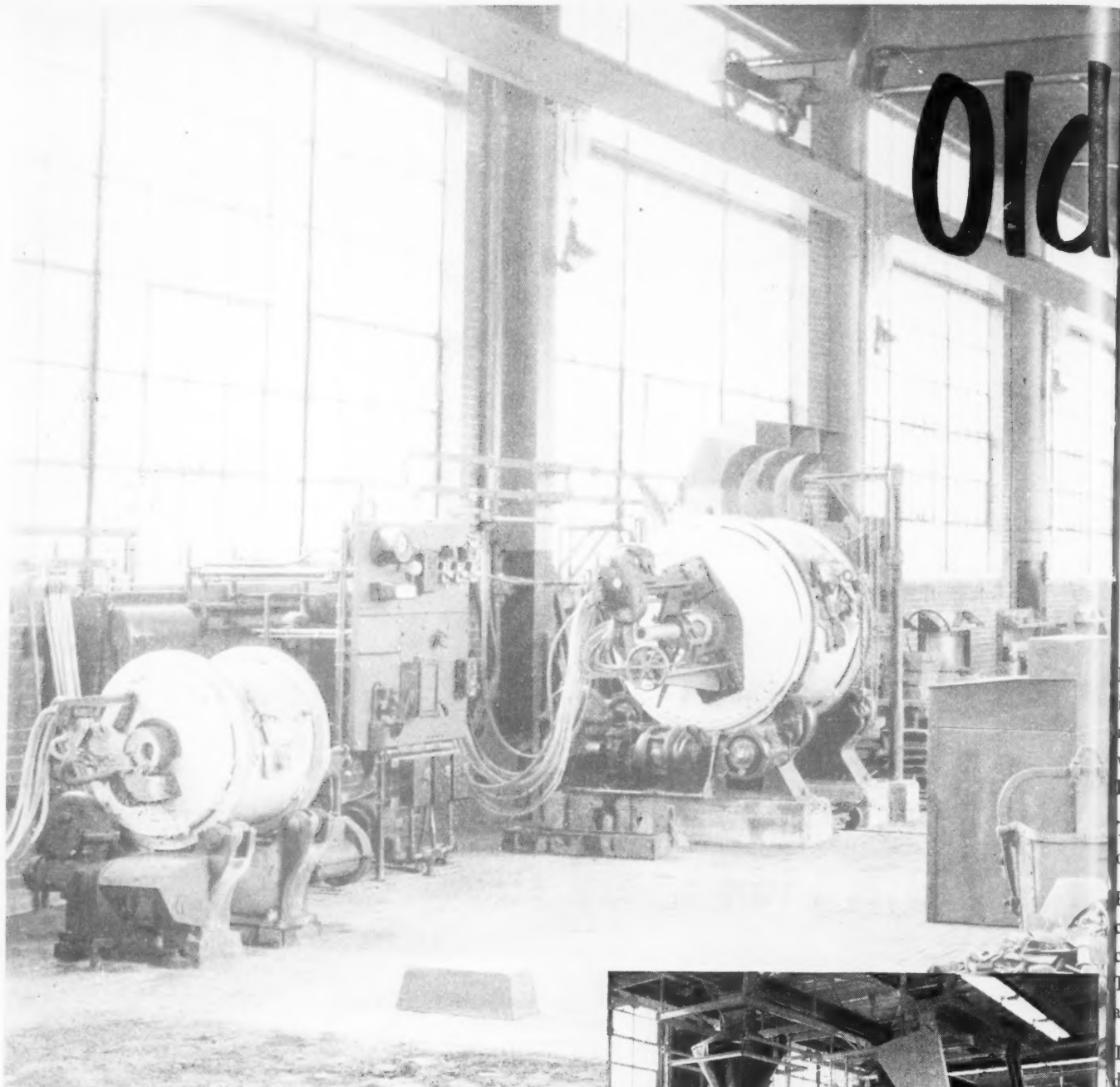
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA INC.

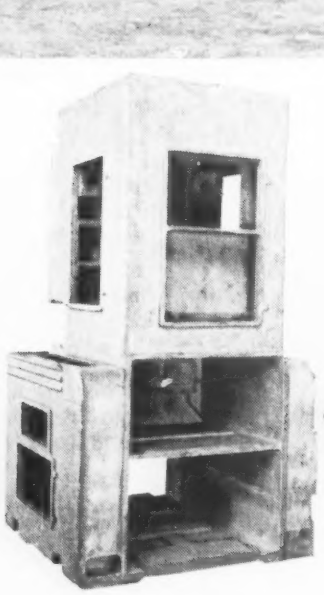
Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

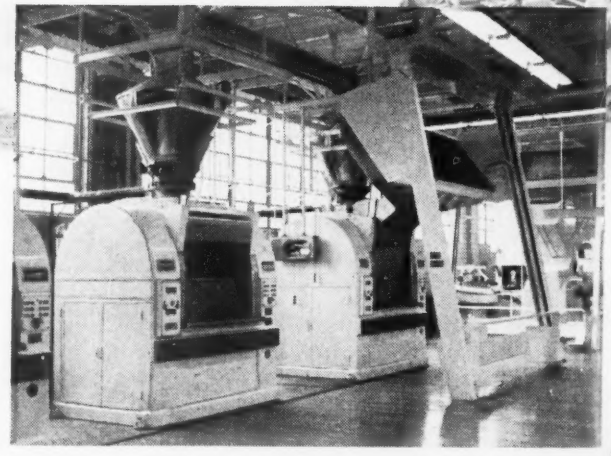
*Trademark of the Pangborn Corporation





Above: *The electric furnace section of Baker Perkins foundry at Saginaw, Michigan. Left, Type LFA, 350 lb.; right, Type AA, 1000 lb.*

Left: *Casting for machine tool base, produced by Baker Perkins.*



A battery of Baker Perkins dough mixers, one equipped with dough trough elevator. Baker Perkins also manufactures mixing machinery used in processing of candy, chewing gum, cold creams, paints, soap, tooth paste, and many other products.

enough to vote!

These 22 year old Detroit ROCKING Electric Furnaces produce high-quality iron melts every working day...

Baker Perkins, Inc., makes bakery machinery and chemical mixing machinery, and produces castings for other manufacturers. To supply the company's needs for a variety of special iron and steel melts, there are two Detroit Rocking Electric Furnaces in the foundry.

These two furnaces are 22 years old, and they still turn out efficient melts of nickel irons and steels day after day.

Precise control of analysis is one of the outstanding characteristics of Detroit Electric Furnaces. The melt is completely homogeneous because of the rocking action. There's no carbon pick-up from electrodes, since they are free of the bath at all times.

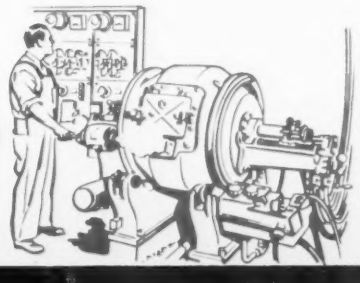
Temperature control is extremely accurate, too. A desired melting cycle can be established and closely followed through melt after melt, resulting in fast, most efficient operation.

Detroit Rocking Electric Furnaces bring economies to the foundry floor through optimum use of power, minimum heat loss, less metal shrinkage, more heats per working days, reduced out-of-production time because of longer refractory wear and easy shell replacement.

Furnace capacities—for ferrous and non-ferrous melting—range from 10 to 4000 pounds, and are individually designed to meet your plant's electrical specifications.

Get the advantages of Detroit Rocking Electric Furnace operation in your plant. Outline your operating needs and we'll show you how these furnaces can help you. Write today!

aster melts, better melts



ROCKING ACTION DOES IT!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

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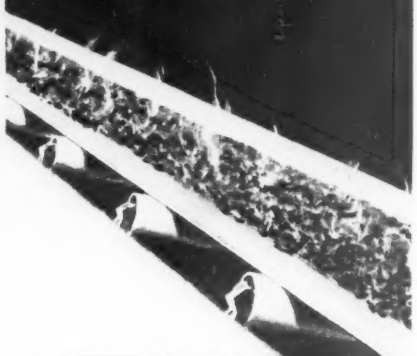
SAHARA
Heat Resisting
BELTING
For Handling
Hot Materials



Foundry records prove Sahara Belting is unexcelled for conveying and elevating hot materials.

Special Construction—The heat resisting efficiency of Sahara Belting is due to special impregnation and insulation developed by Imperial during the past 40 years. The base of both Sahara and Insulated Sahara is 37½-ounce, tight-woven duck with a tensile strength of over 700 lb. per inch of width. Ply separation is permanently prevented by our double-stitched, Inner-Locked construction.

Heat Resistance—For temperatures up to 300° F., STANDARD SAHARA is recommended. For 300° to 450° F., use INSULATED SAHARA which combines asbestos and special insulating materials with the tight-woven silver duck base. SUPER-INSULATED SAHARA has double plies of asbestos and insulation to withstand sustained heat up to 600° F.

Write for Data Sheet 47-8 and prices on Sahara Belting.

IMPERIAL BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

Imperial
INNER-LOCKED
BELTING
Engineered Belting—
The Right Belt for Each Job

With the EDITORS

OPEN HOUSE: Officers, directors, union officials and all employees of Albion Malleable Iron Co. should have a warm feeling of satisfaction over the success of the open house held Nov. 13 to 17 to celebrate the completion of a large expansion of annealing, grinding, finishing and shipping facilities. In the company publication, "The Circle-A-Tor" published just prior to the affair, President Collins Carter said, "The completion of our current expansion program affords us an excellent opportunity to visually demonstrate with pride the changes in foundry methods and working conditions which have taken place at the Albion Malleable Iron Co. over the last ten years." The employees of Albion took President Carter at his word. Everyone in the entire organization seemed

completely thrilled with the opportunity of showing off the plant and the foundry processes. Surely the families of workers, citizens of Albion and the surrounding territory including many from the public schools, the students of several colleges, suppliers of machines and materials, customers and the visitors from many industries of the Central West, came away with a feeling of confidence and respect for the workers and management of Albion.

The editor was privileged to participate in the open house on Friday, Nov. 16, and made the trip through the plant with Cal Chambers, president, and Lowell Ryan, managing director, Malleable Founders' Society.

—o—

Good Things To Come: A few weeks ago the editor was riding the New York Central's Prairie State Limited from Cleveland to Chicago. He had just finished dinner and stopped at another table to see Bill Stephenson, vice president of Hickman, Williams & Co., when the diner door opened and Ralph (Doc) Lee, FOUNDRY columnist, owner and operator of the Lee Hobby Foundry, and expert on "Humanics" burst into the car. The word "burst" is used advisedly since Doc always does things with the vim and vigor of a college athlete. Well, after Doc's hunger had been satisfied (it was intensified because he had been too busy making talks to eat lunch) we adjourned to the club car and had the best three-hour gabfest one could imagine. Ed Sherwin, president of Chicago Hardware Foundry Co. got on at Elkhart, and stopped for a few minutes on his way from the diner. By this time the trip had taken on the appearance of "Old Home Week." Doc Lee told us about some of the ideas he has in mind for future articles in FOUNDRY and we know you are going to enjoy them.

—o—

History: Several days later, riding the Pennsylvania's Trail Blazer from the old home town of Plymouth, Ind., to Crestline, O., the editor looked up to see Bob Belt, for many years secretary of the Malleable Founders' Society, on his way to the observation car. Bob was traveling to Philadelphia, New York and Boston to carry on further research for a "History of the Malleable Iron Industry," which he has been working on for some time. We knew about this history because Bob spent considerable time in our office last summer going through the bound volumes of FOUNDRY which contain all issues from Vol. I, No. 1, date September, 1892 to the present time.

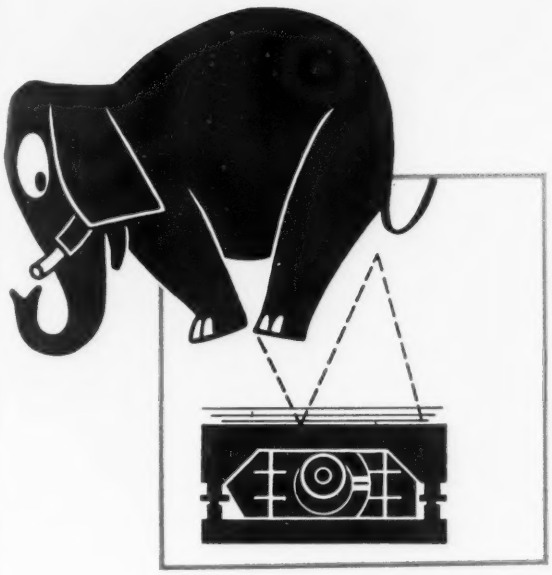
—o—

Research: The idea of universities devoting time to research on foundry problems appears to be spreading. For example, we recently received a 54-page booklet entitled, "Reports of the Casting Research Laboratory," published by Waseda University, Tokyo, Japan. Published in English, this report, marked No. 2 tackles such problems as: A Theory of Globular Graphite Formation in Cast Iron; Metal Penetration in Casting; Improvement for Machinability of Cast Al Alloys; Austenitic Malleable Cast Irons; Spheroidal Graphite Cast Iron, and seven others.

—o—

Anniversaries: Congratulations to Maury E. Lippert of Silverstein & Pinsof who was honored on Nov. 21, at the Sarah Siddons Walk, Ambassa-

(Concluded on page 12)



SIMPLICITY SPRING-MOUNTED SHAKEOUTS GIVE YOU MORE ACTION TO THE TON

Foundrymen know that it takes plenty of "live action" to knock out cores and shake the sand from flasks and castings that sometimes weigh 100 tons or more. Simplicity Spring-Mounted Shakeouts do this job thoroughly in less time because of the controlled vertical action that's concentrated at the deck where the action will do the most good.

Simplicity's controlled vibration is the secret. In Simplicity Spring-Mounted Shakeouts, vibration is confined to the deck alone. The rigid supporting structure of the shakeout will not vibrate even with a light foundation.

Up on the live deck, you get positive controlled vertical action because of Simplicity Shaft Design and Special Corner Snubbers. This means absolutely no casting travel towards one end of the deck — a dangerous hazard if the casting or flask slips its chains. Flasks last longer and more important, casting damage is completely eliminated.

The massive deck and body construction of Simplicity Spring-Mounted Shakeouts insures dependable operation and lasting service, cuts maintenance costs to a minimum. Available in all larger sizes for use as single units or in combination. For complete information write today to . . .

Simplicity 8' x 10' Model OA Special Spring-Mounted Shakeout

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(*Concluded from page* 10)

dor East Hotel, Chicago, with a dinner dance staged by the company to celebrate his fiftieth birthday and eleventh year as sales manager.

—o—

Write to Sam: Samuel R. Robinson, retired, well known and widely experienced steel foundry expert and metallurgist and frequent contributor to the technical pages of FOUNDRY, will be pleased to see or hear from friends, Boys of the Old Brigade, with whom he stood shoulder to shoulder on open-hearth floors and converter pulpits in many places over a period of many years. The address is 1482 East 248th St., Euclid, O.

—o—

Award: Ed Hoenicke, manager, Foundry Division, Eaton Mfg. Co., Vassar, Mich., let us have a copy of a recent award of the National Safety Council to his organization "in recognition of its outstanding achievement in reducing the frequency of disabling injuries." Congratulations to Eaton, and all other foundries receiving safety awards from

NATIONAL SAFETY COUNCIL

AWARD

TO

EATON MANUFACTURING COMPANY

FOUNDRY DIVISION, VASSAR, MICHIGAN

IN RECOGNITION OF ITS OUTSTANDING ACHIEVEMENT

IN REDUCING THE FREQUENCY OF DISABLING INJURIES

GROUP B, FOUNDRIES DIVISION

METALS SECTION SAFETY CONTEST

JULY 1, 1950—JUNE 30, 1951

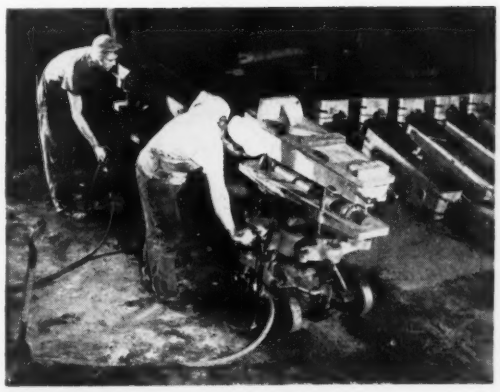
the National Safety Council, the Steel Founders' Society of America, the Gray Iron Founders' Society, and other organizations. Preventing crippling injury, or for that matter any type of injury, surely is the human thing to do. But it also is good business, and the mark of enlightened management.

—o—

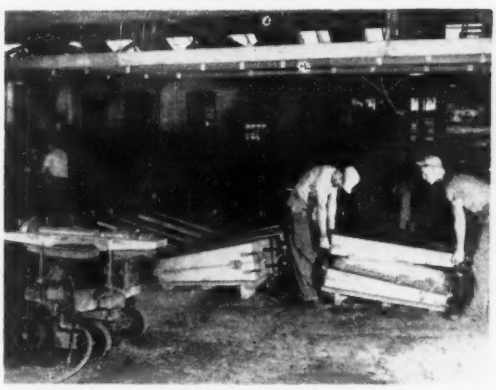
The Wide Open Spaces: Seems like some people expect the editors to know a lot about many things. For example, Chet L. Swital, 415 N. Beverly Drive, Beverly Hills, Calif., recently wrote that he is a book collector and has a great hankering to obtain a copy of an earlier thriller, *Automobile Lillian, the Daring Girl Bandit of Arizona,* which was published by the Royal Publishing Co., South Norwalk, Conn. Has anyone seen a copy of Lillian around lately?

—o—

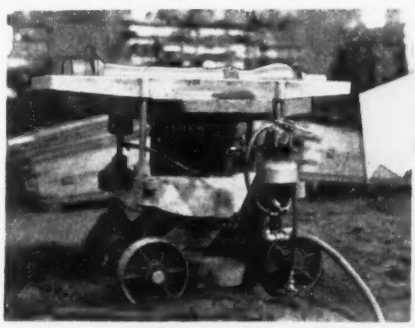
Happy New Year: May 1952 see the end of wars, the dawn of peace and the return of our young men from the fields of battle in foreign lands. This certainly would be a HAPPY NEW YEAR. F.G.S.



Both cope and drag being made on Davenport Pin-Lift machine.



Mold being closed.



Pattern mounting of proper design to support overhang.

Davenport

Jolt Stripper Pin-Lift Molding Machines

HANDLING COPES and DRAGS with an INEXPENSIVE MOLDING SET-UP

DAVENPORT JOLT PIN-LIFT MOLDING Machines can be depended upon to produce better molds with unskilled labor at lower cost and with a minimum investment in equipment. The photos at the left are one of many examples where this type of set-up is producing the desired results. Why not let a Davenport engineer help you with your molding problems.

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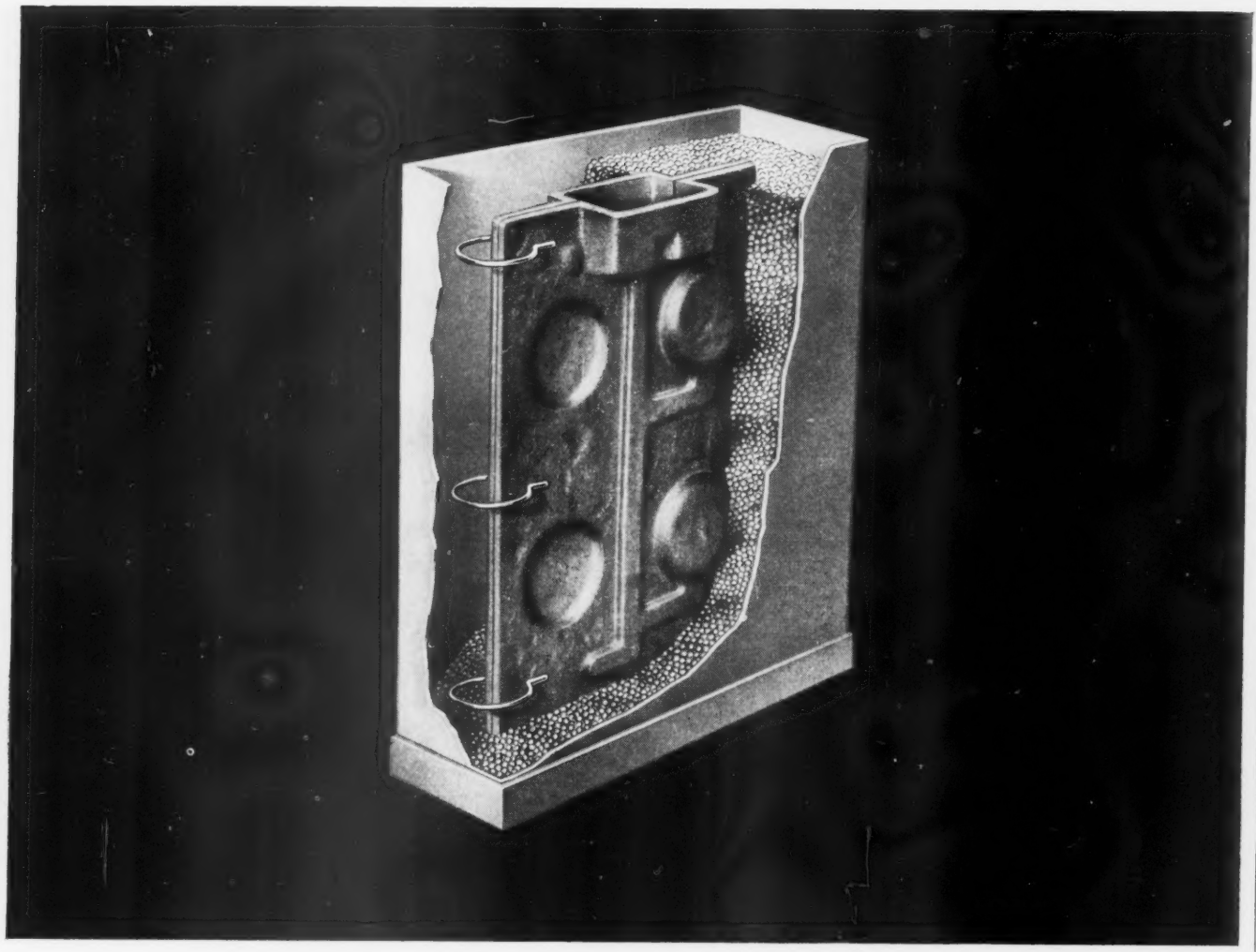

5 STAR SAVER

Time Saver, Sand Saver, Scrap Saver, Space Saver, Money Saver

This is a sample sand mold produced by the shell molding process for making thin-shell molds and cores bonded with BAKELITE Phenolic Resins. The process not only yields better castings, but a greater number of castings per ton of metal poured.

It makes ferrous or non-ferrous castings with tolerances as close as .002 to .005 of an inch per inch. The fine-grain sands used give virtually pattern-smooth surfaces, minimizing finishing time and costs, and conserving metal.

Molds and cores are of uniform quality, highly porous, permitting escape of gases; strong, moisture-resistant and stable, with long storage life. Built-in dowel pins and holes assure accurate registration of the mold parts as the metal is poured.

Ninety per cent less sand is required, with important savings both in floor space and handling. And the process lends itself readily to mechanization resulting in more economical foundry operations.

For information about BAKELITE Phenolic Resins for the shell molding process, use the attached coupon.

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Please mail at once my free copy of the booklet "BAKELITE Phenolic Resins for Foundry Molds and Cores."

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more production... less waste!

COLEMAN OVENS

Coleman Tower Oven at Forest City Foundries Co.

● **COLEMAN TOWER OVENS** produce perfectly baked cores, need less manpower, result in increased tonnages of better quality castings.

Patented open center, by increasing oven loading accessibility, improves productivity of the coremakers. Coleman Tower Ovens, using only 25% of the floor space required by batch-type ovens provide labor savings up to 75% by eliminating racks, trucks and other time-wasting handling methods.

Coleman Tower Ovens help you overcome acute labor shortages and scarcity of materials. They are vital in meeting the demand for increased casting production.

Only COLEMAN OVENS offer all these advantages:

- PERFECT DRYING AND BAKING eliminate manpower and casting losses due to make-overs and rejects.
- INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.
- HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost.
- GREATEST SAVINGS IN FUEL by using the most economical fuel available.
- MOST ECONOMICAL CORE BINDERS, oil or resin, for your particular casting requirements, can be used.

A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

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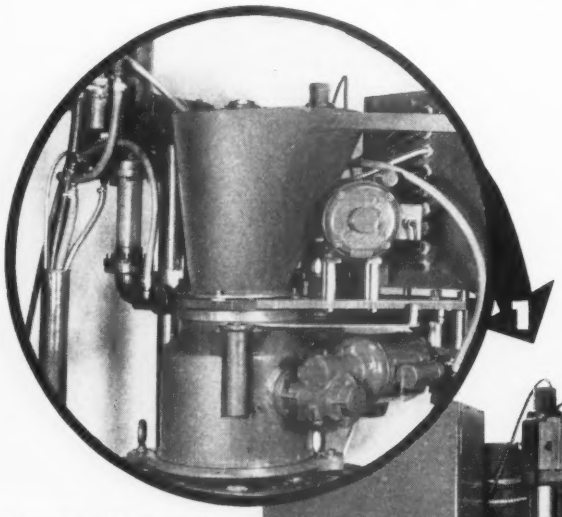
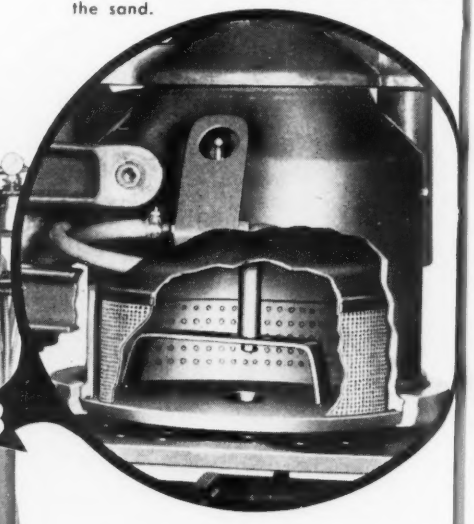
IT'S NEW! IT'S MODERN! IT'S FAST

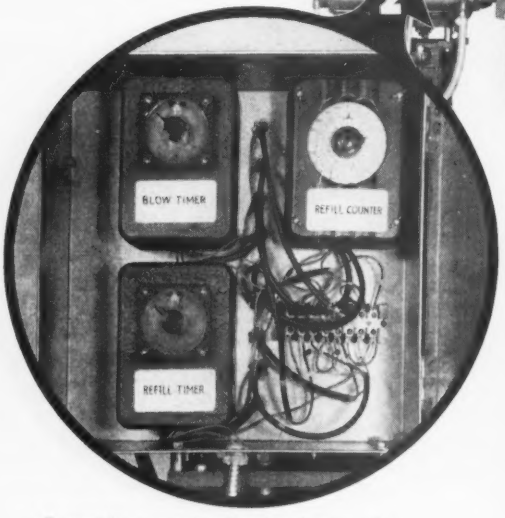
Federal presents the
NEW for '52 FULL-AUTOMATIC "SAN-BLO"



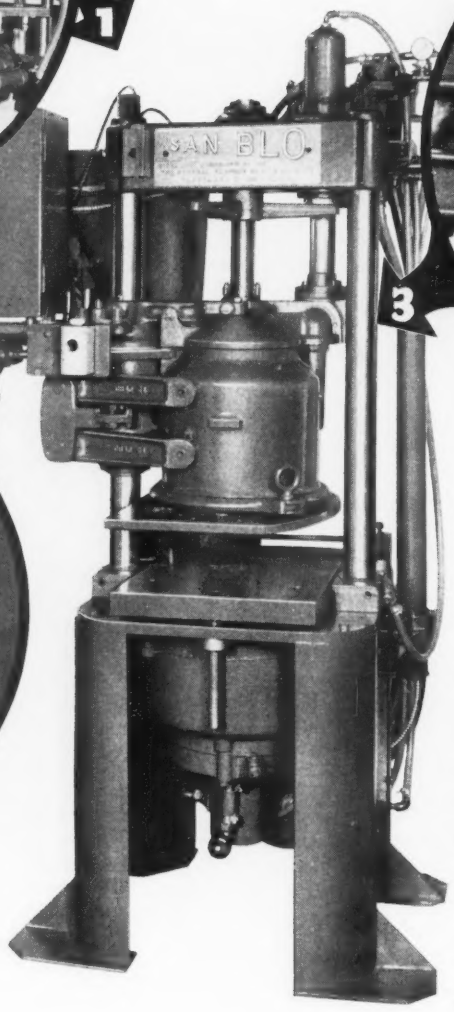
Large sand hopper with motor-driven agitator, for automatic refilling of sand magazine, is located at rear of machine for convenient loading from above.

Cut-away view of sand magazine showing motor-driven plows that move sand and prevent "piping" and "bridging"—and fine mesh screen through which air is delivered into lower section of magazine to aerate the sand.





Control box contains (1) electric timer for blowing cycle, (2) electric counter for controlling movement of sand magazine to hopper, (3) electric timer for holding sand magazine under hopper for filling.



- **Quick Job Changes**

  One adjustment wheel quickly raises or lowers sand magazine to accommodate core box. Sand magazine is standard—is never changed.

- **Wide Range of Core Boxes**

  The SAN-BLO will blow all cores from the smallest to those weighing 40 lbs. each—and blow them all from its one standard sand magazine.

- **80% Sand Delivery**

  The SAN-BLO blows 40 to 42 lbs. of its 50 lb. magazine load because sand is moved mechanically to the blow hole. No "piping" or "bridging".

- **Automatic Safety Features**

  Air pressure is cut off automatically while sand magazine is being refilled. Blowing cycle cannot start unless the core box is in blowing position.

- **Clean Operation**

  Precision construction prevents sand leakage or blow-by—making SAN-BLO the cleanest-operating core blower.

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ST TOMORROW'S CORE BLOWER...TODAY!

The NEW FOR '52 "SAN-BLO" — the fastest, most efficient core blower! Time consuming, manual operations are performed by electric controls, described below. Complete operation of blowing cycle is reduced to simply pressing one starting button—the controls do the rest. The amazing new controls are *plus* features, in addition to SAN-BLO's motor-driven plows and aerating air circuit. These exclusive design features made possible for the first time the successful blowing of *any* core sand that could be hand-rammed, and blowing *any* size core up to 40 lbs. without changing sand magazine.

BLOWS 10 LB. CORES in 2½ SECONDS — 40 LB. CORES IN 5 SECONDS

In only 2½ seconds from the time the starting button is pressed, a uniform, accurate 10 lb. core is ready to be taken from the machine. In only 5 seconds, a 40 lb. core. The ultimate in fast production of high quality cores made from *any* core sand mixture.

AUTOMATIC, ELECTRICALLY-TIMED FILLING OF SAND MAGAZINE

The large sand magazine does *not* require refilling after each blow. An electric counter controls automatic refilling. At intervals, depending on size of core being blown, magazine automatically swings back under hopper, fills and returns to blowing position. Motor-driven agitator in sand hopper provides immediate filling of sand magazine, and operates only when magazine is in filling position. See photo No. 1.

AUTOMATIC, ELECTRICALLY-CONTROLLED BLOWING CYCLE

An electric timer, graduated in seconds, provides correct timing of the blowing cycle. Size of core and type of sand being blown govern setting of timer. Fixing the time of the blowing cycle assures a steady production of uniform cores. See photo No. 2.

MECHANICAL MOVEMENT OF SAND IN SAND MAGAZINE

Motor-driven plows, which operate only during blowing cycle, revolve in lower part of sand magazine, move sand mechanically to blow hole and keep an even distribution of sand over entire blow plate. *No* "piping" or "bridging" in sand magazine at any time. An "aerating" air circuit feeds air, under full pressure, through a fine mesh screen which forms the lower inner wall of the sand magazine. By aerating the sand and moving it mechanically, SAN-BLO can blow *all* types of core sand and blow them to uniform hardness. See photo No. 3.

AUTOMATIC DRAWING OF CORE FROM COPE OF CORE BOX

An air-oil controlled clamping table, with 6" stroke, provides vertical clamping of core box. By fastening the cope half of core box to blow plate and blowing into a drier, core can be drawn from the cope. By setting up a conveyor system at rear of machine, cores on driers can be ejected as empty driers are inserted in blowing position from the front.

OPERATION—Initial setting of controls is simple and need be done only once for an entire run of any core: (1) set blowing cycle timer, (2) set refill counter, (3) set refill timer, (4) adjust sand magazine position, (5) set core box stop. After these settings, the only operations are to insert box, press starting button and remove box.

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Please send me a copy of your free catalog No. CB-3, describing the new FULL-AUTOMATIC "SAN-BLO" and other models available.

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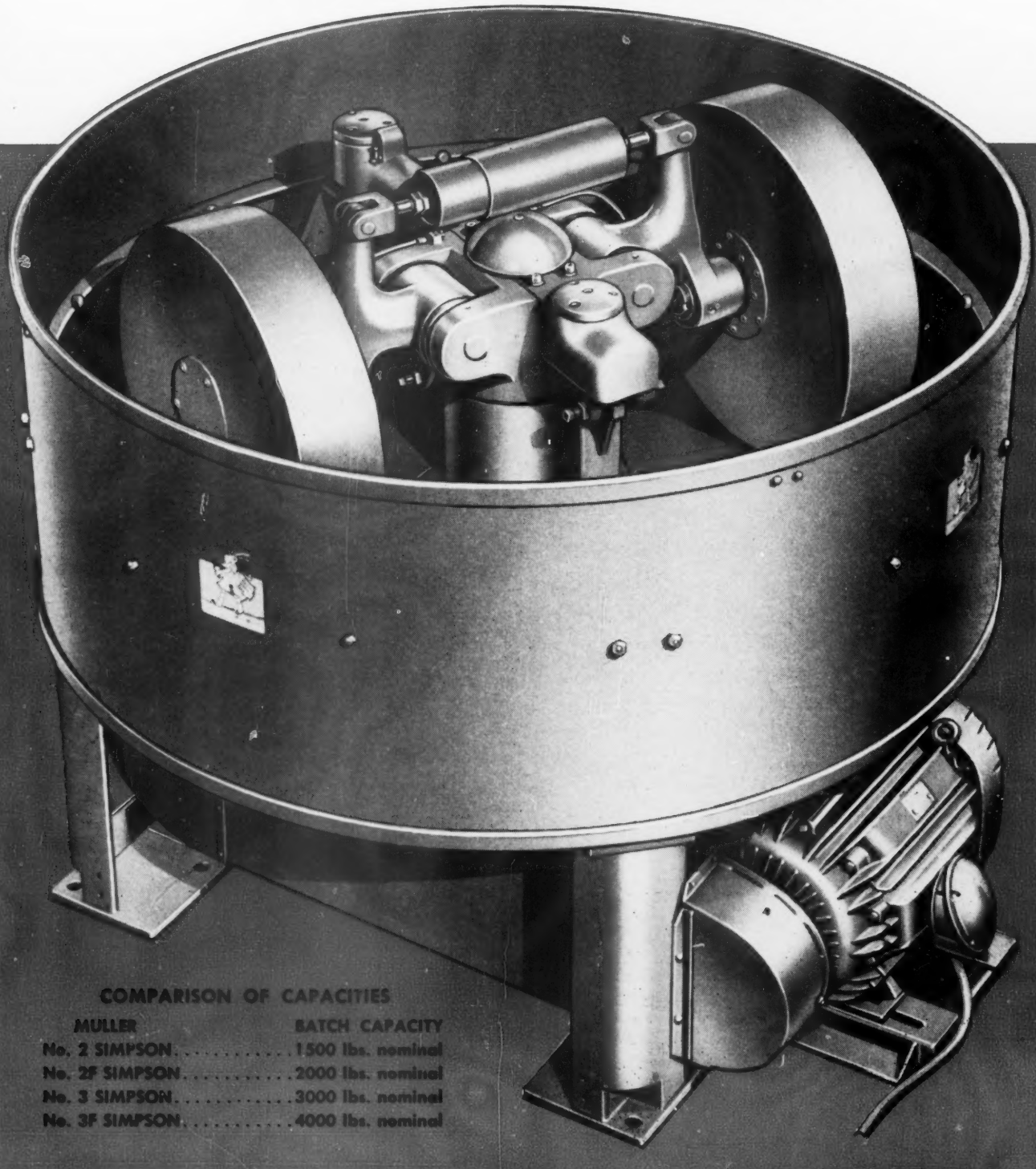
33 1/3 % MORE CAPACITY

with the New 2F and 3F
SIMPSON *Intensive* Mix-Mullers



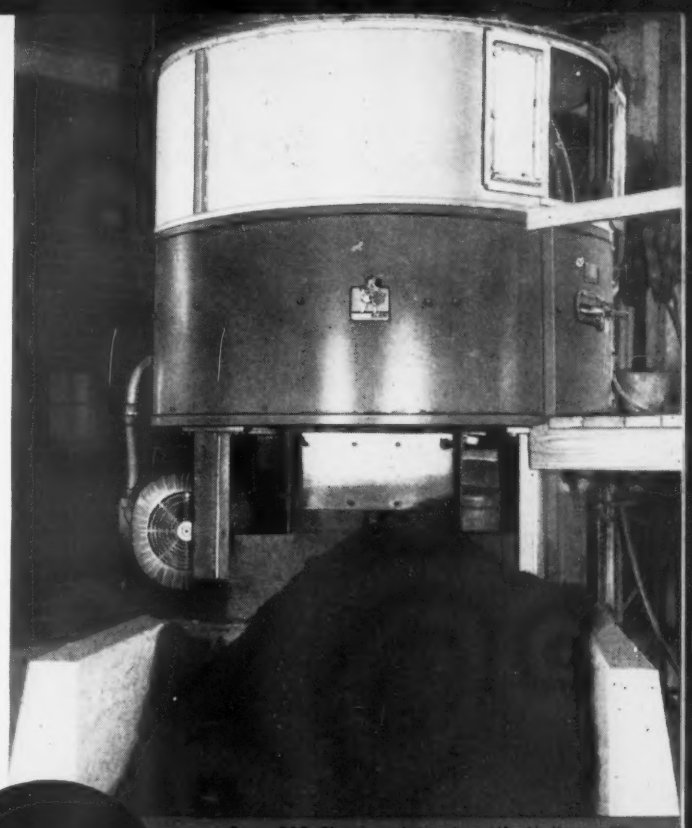
COMPARISON OF CAPACITIES

MULLER	BATCH CAPACITY
No. 2 SIMPSON	1500 lbs. nominal
No. 2F SIMPSON	2000 lbs. nominal
No. 3 SIMPSON	3000 lbs. nominal
No. 3F SIMPSON	4000 lbs. nominal

NEED increased production? Then remember that one of the most important features of the new 2F and 3F Simpson Intensive Mix-Mullers is their ability to handle at least one-third more capacity than the standard No. 2 and No. 3 mullers. Equally important is the ability of these modern, heavy duty mullers to produce the highest quality sand . . . which in turn assures highest quality castings, with less rejects, lower scrap loss.

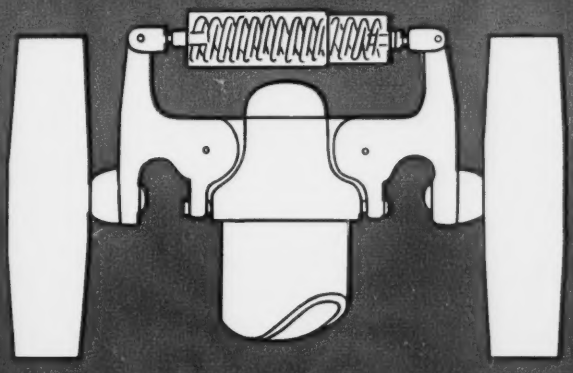
These 2F and 3F Simpsons are the culmination of years of specialized experience in the design and manufacture of Intensive Mullers. They are engineered to meet the widest possible range of sand requirements throughout the foundry industry.

Why not let our engineers prove what these high production Mix-Mullers can do for you? In the meantime send for a copy of our descriptive Bulletin 511.



PROVED IN USE

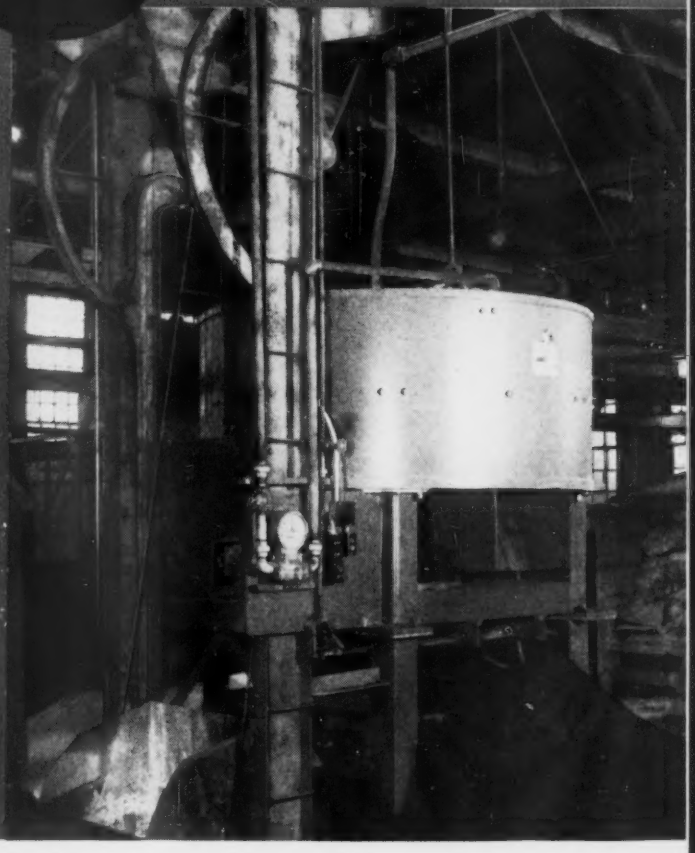
Over 200 Simpson Intensive Mix-Mullers with the new adjustable muller design have been thoroughly proved in use. The 2F and 3F units illustrated here, installed in two large midwestern foundries, are typical of the Simpson units now producing greater quantities of properly prepared sand.



SPRING-LOADED MULLERS MAKE THE BIG DIFFERENCE

• The comparatively lighter mullers with adjustable spring pressure, as used in the 2F and 3F Mix-Mullers, greatly increases the efficiency of the mulling action, as the pressure can be adapted to the type of sand to be conditioned.

Because of the plow design and the muller suspension, the sand is subjected to much more violent agitation, and is considerably increased in volume. The agglomerate grains are broken up, any tendency to form "muller cake" is reduced, and a fluffy sand of high flowability results.



Write for BULLETIN 511

SIMPSON *Intensive* MIX-MULLERS

National Engineering Company

608 Machinery Hall Bldg. • Chicago 6, Illinois

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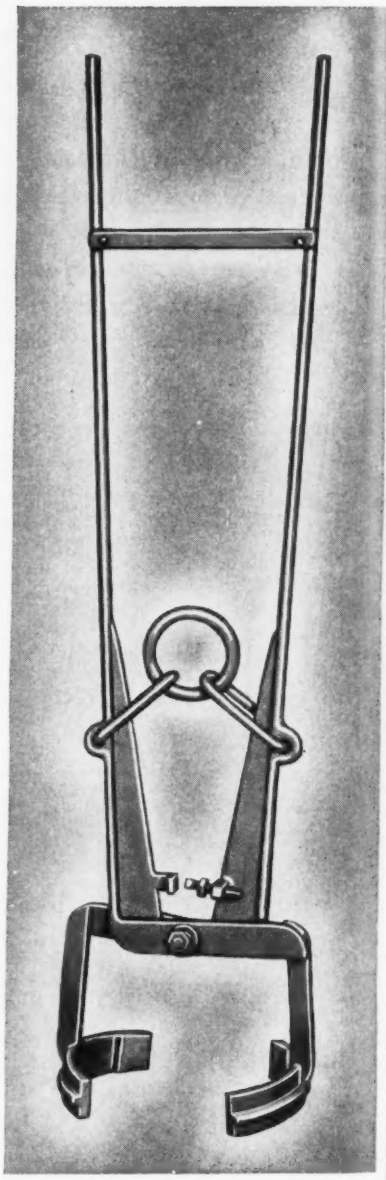
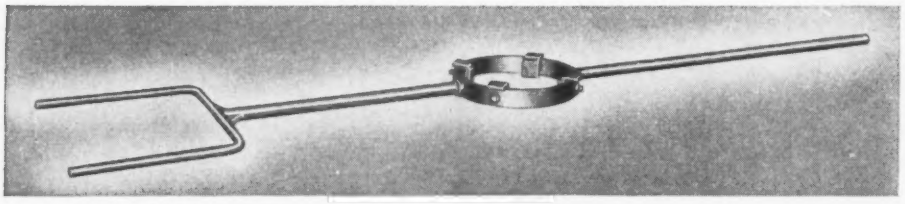
Industrial Equipment round bottom pressed steel ladle bowl, 50 lb. capacity, type 7 flat side.

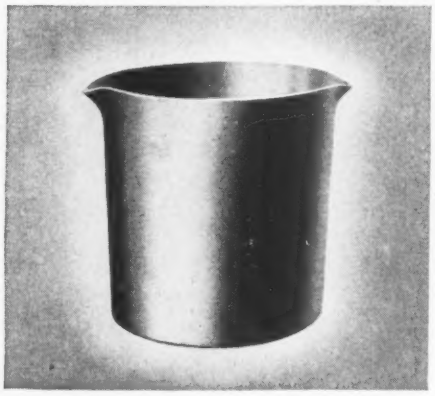
Industrial Equipment round bottom pressed steel ladle bowl, 60 lb. capacity, type 14 circular.



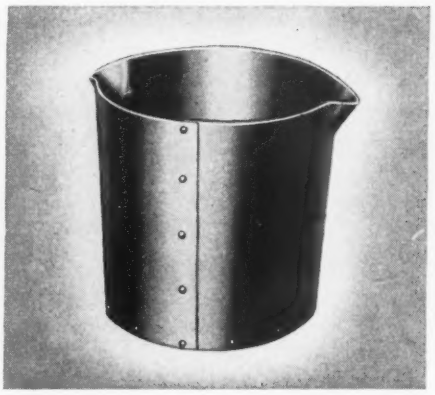
Type 72C crucible tongs. Adjustable. Four-point suspension. Claw types also available.



Industrial Equipment type 30CA single and adjustable ladle and crucible shank. Four-point suspension . . . easily adjustable . . . no springs . . . air cooled band. Fixed band types also available.



Industrial Equipment type 514 flat bottom welded steel ladle bowl. Available in almost any size or thickness.



Industrial Equipment 537 flat bottom riveted steel ladle bowl.

The above Industrial Equipment products, along with dozens of other types of bowls, shanks, tongs and ladles, are included in our latest catalog. *Write for your copy.*

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Because . . .

1. Norton grinding wheels are designed for fast, clean cutting over the entire range of metals — ALUNDUM* abrasive, for example, on metals of high tensile strength and CRYSTOLON* abrasive on metals of low tensile strength.

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That's why there's a Norton wheel that will do every foundry grinding job for you — from smallest portable machine work to heavy swing frame snagging — in the shortest possible time, at the lowest possible cost. And your Norton distributor and Norton abrasive engineer are always ready to help you select exactly the right wheels.

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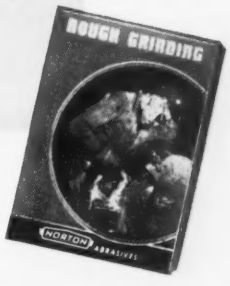

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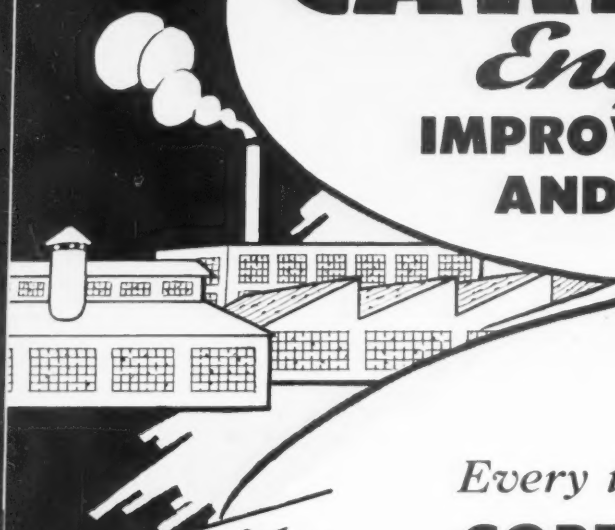

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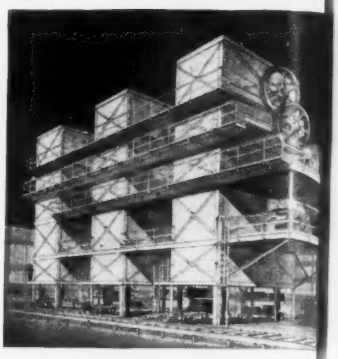
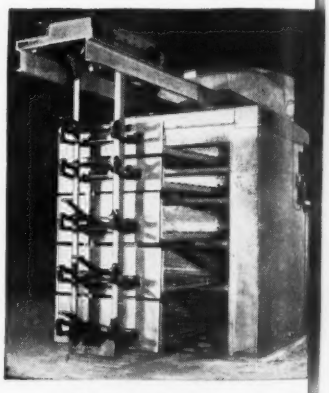
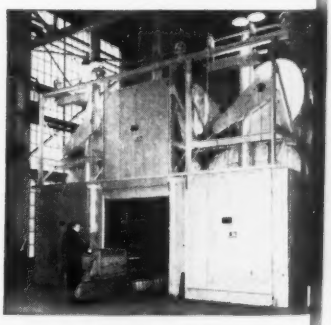


VERTICAL CORE OVENS
at General Steel Castings Co



ROLLING DRAWER CORE OVE
at Aluminum Co. of America



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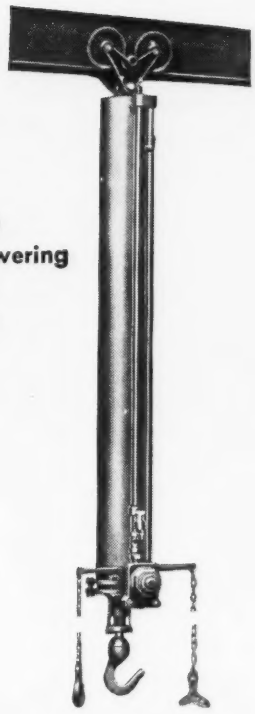

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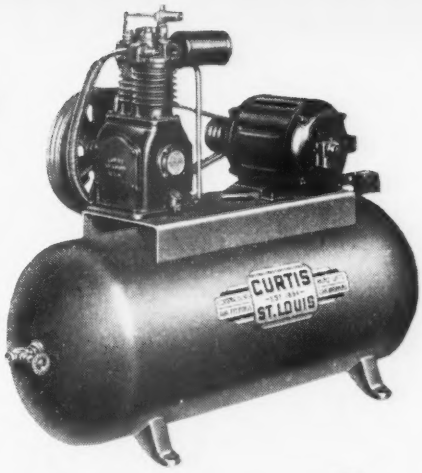

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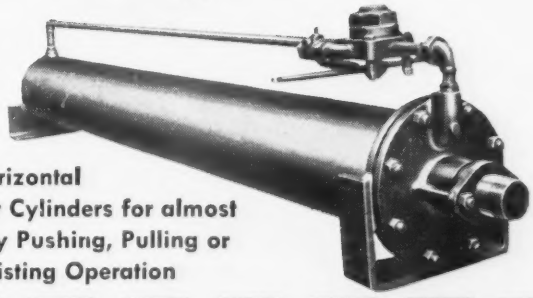

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Universal Flask Pins and Bushings are heat-treated and precision ground from finest quality steels. They will save you precious minutes of production time by assuring instant, accurate alignment of cope and drag. Universal Flask Pins and Bushings will give you long, satisfactory service and they will stand up under extremely rough treatment, thus saving you the additional cost and down-time that replacement always requires. Universal Flask Pins and Bushings are typical of the quality products being produced at the big, modern plant of the Universal Engineering Company in Frankenmuth, Michigan.

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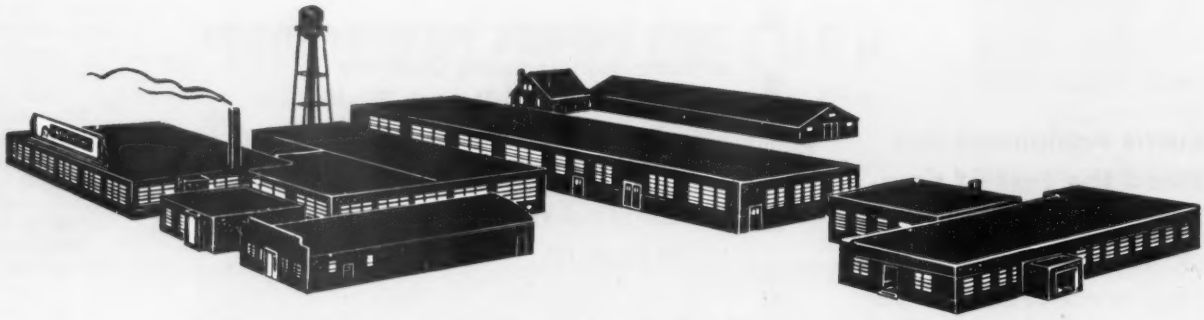

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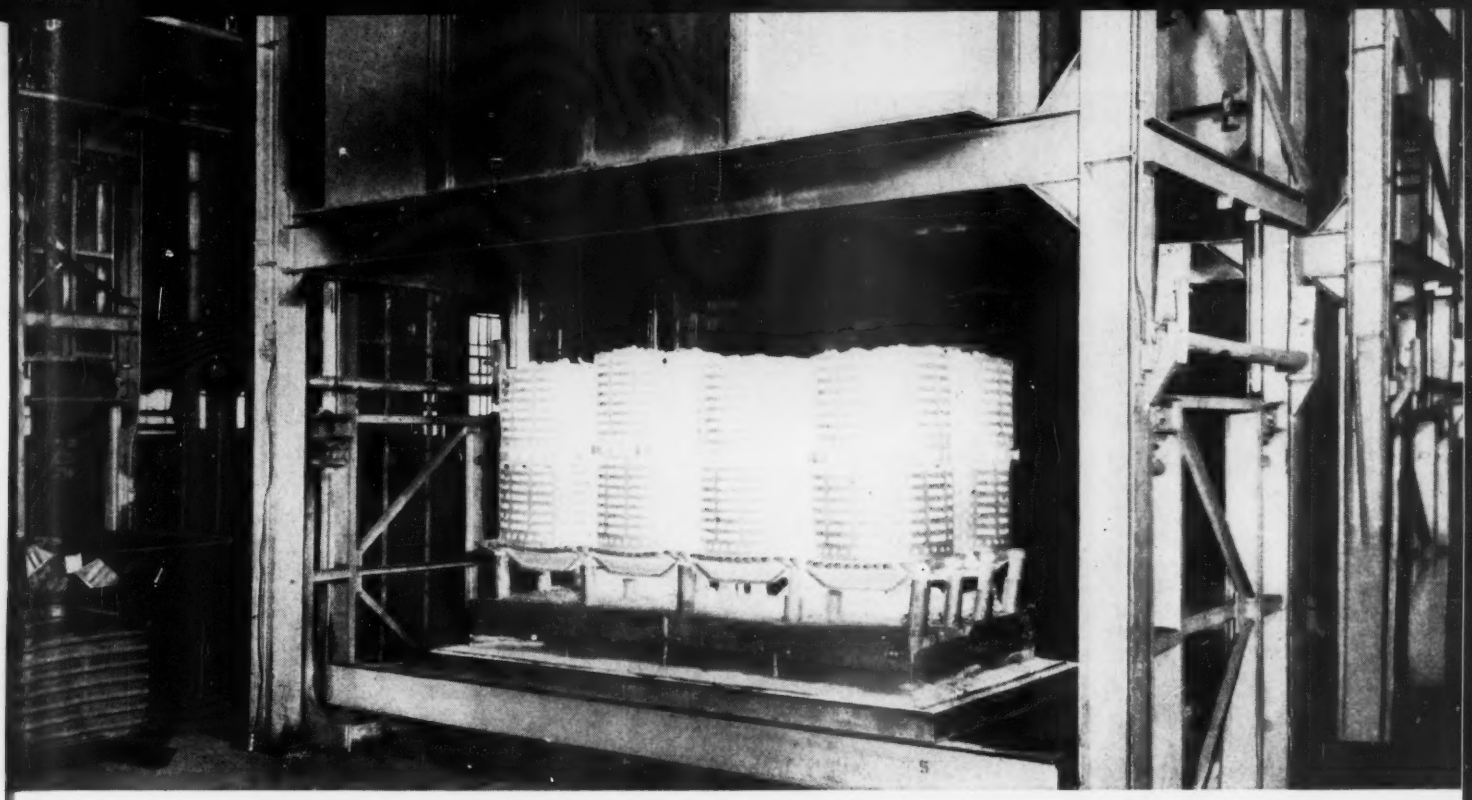

Hot charge being transferred from high-temperature furnace to low-temperature furnace.

Cut Your Overall Annealing Costs with G-E furnaces

Let the experienced G-E Heating Specialist do a cost study on your malleable plant, as he did for this manufacturer of malleable iron. His recommendations, based on many similar applications, showed this customer that G-E elevator electric furnaces would give the greatest long-range returns for the capital investment.

Give *your* malleable-annealing operation the advantages of electric heat. Here's how G-E furnaces can help you as they helped this manufacturer. Electric heat gives you:

Lower overall annealing costs
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LEARN MORE about how G-E electric furnaces can speed your production and lower the *overall costs* of processing malleable iron. Call your nearby G-E Sales Office right away. And, to learn more about the furnaces for malleable annealing, clip this coupon and mail it today.

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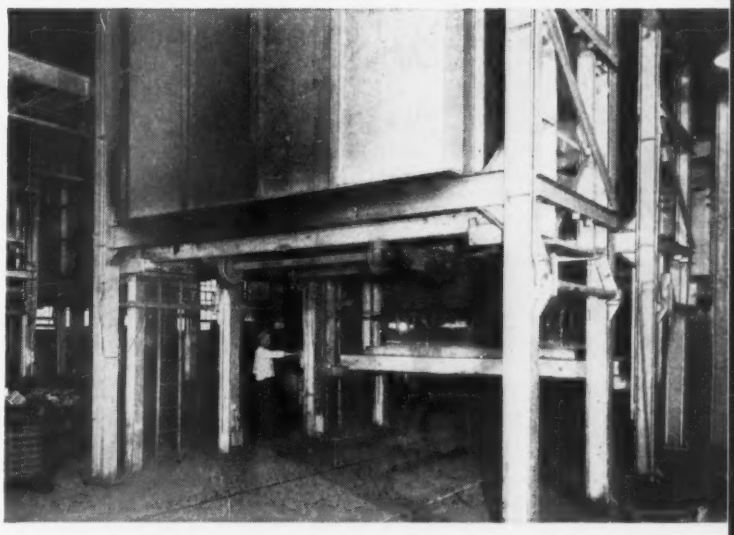

Uniformly-annealed castings being removed from low-temperature furnace. This installation has four pair of G-E furnaces.

Sect. 720-52, General Electric Co.
Schenectady 5, N. Y.

Please send me immediately the following publications on furnace equipment.

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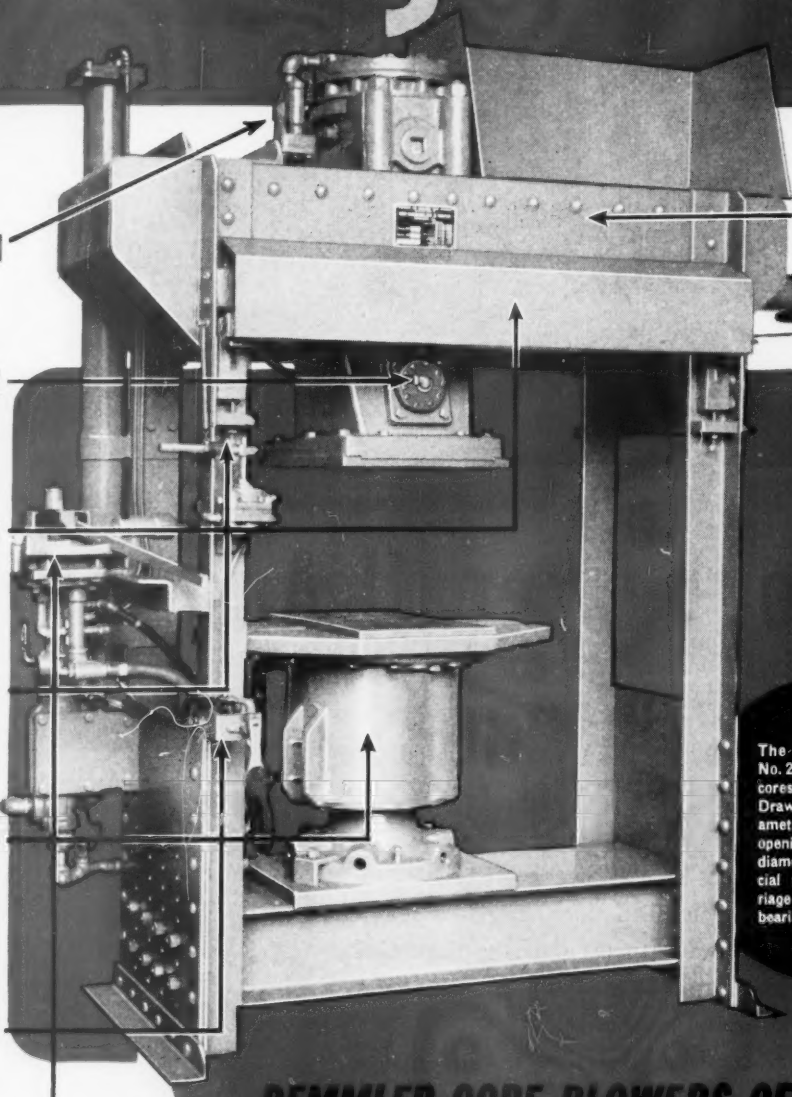
Better Eight Ways



1 Ultra high speed blow valve action — increasing initial blow pressure 25% above other machines.

2 Magazine exhaust valve – extra large size – quick acting – immediately exhausts air from magazine after core is blown.

3 Cross head rails – on outside of machine frame – out of sand area – where drawing accuracy would be impaired.

4 Leveling adjustment – 4 screw adjustment for complete adjustment of core box to draw–EASILY ACCESSIBLE.

5 Completely enclosed drawing post – drawing accuracy within thousandths – protected from sand and abrasion – assuring long, trouble-free life.

6 2 speed hydraulic draw control – low speed while vibrator is acting and quick drop after core is drawn.

7 Hard, chrome plated valve seats – to insure against rust and deterioration.

8 All parts of machine easily accessible for low maintenance costs.

The popular DEMMLER No. 2E Core Blower handles cores weighing up to 20 lbs. Draw cylinder is 14" in diameter, 10" stroke. Throat opening in carriage is 7" in diameter. Standard or special magazine sizes. Carriage is equipped with ball bearings.

DEMMLER CORE BLOWERS OFFER EVERY IMPORTANT DESIGN ADVANTAGE . . .

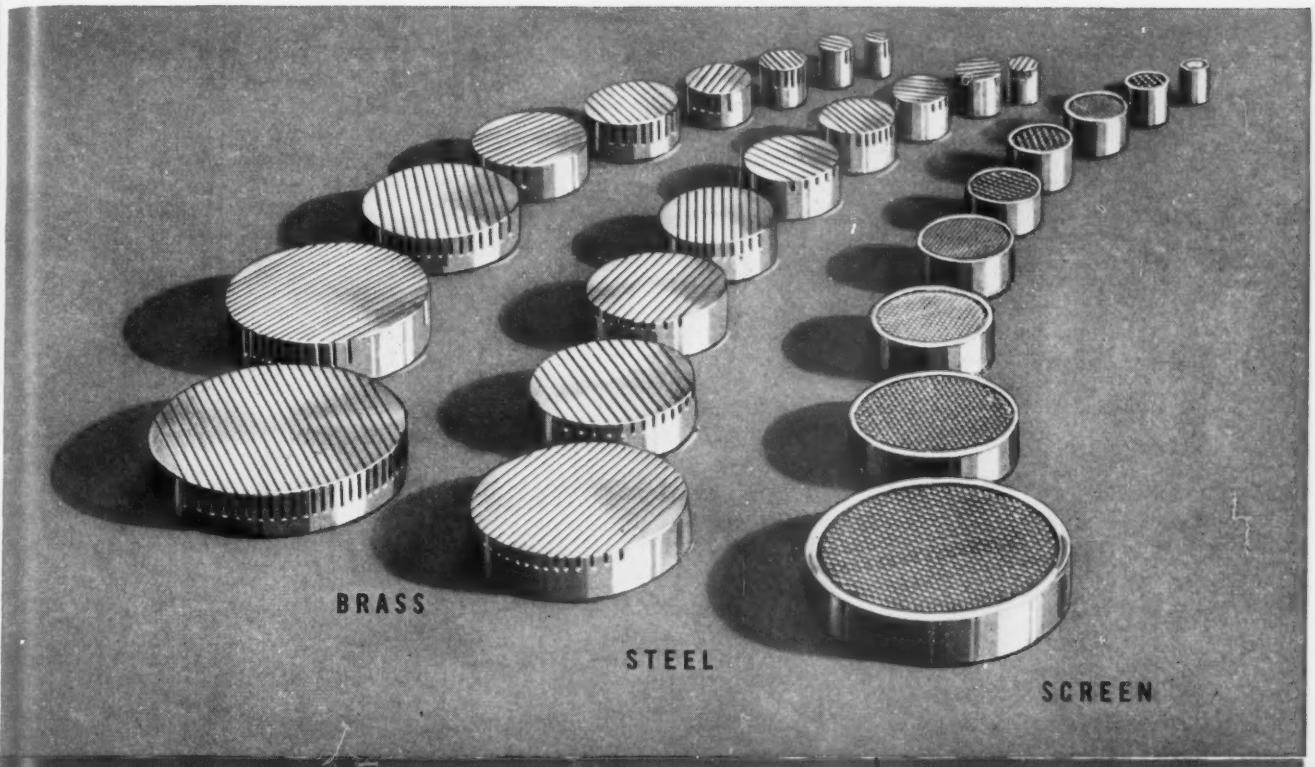
DEMMLER Core Blowers — and only DEMMLER Core Blowers — offer you all eight of the important design features by which core blower value is determined. Here's a check list of DEMMLER features. Compare them with those offered by any other core blower — then you be the final judge of values!

*Remember, every DEMMLER Core Blower possesses outstanding features. Little wonder that DEMMLER Core Blowers are often copied – never equalled!

Wm. DEMMLER & BROS., Kewanee, Illinois

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911

speed plus dependability



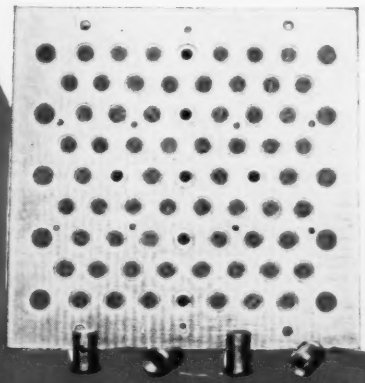
PRECISION CORE BOX VENTS BY

DEMMLER

You eliminate all guesswork when you use precision made DEMMLER Core Box Vents. These high-quality vents adhere precisely to specifications because they are precision built to close tolerances. In addition, DEMMLER core box vents possess great rigidity — are truly designed for practical foundry application.

Dependable, efficient, long-lived DEMMLER core box vents are available in brass slotted, steel slotted and screen types. Each of these types offer a wide variety of sizes to meet every application.

Always specify DEMMLER core box vents — you can count on them for quality far above ordinary standards.



UNIVERSAL BLOW PLATE

DEMMLER Universal Blow Plate consists of two plates with separators between, allowing the air from the core box to escape between the plates. The blow tubes and vent bushings are interchangeable so any hole in these plates can be used either as a blow hole or a vent. These plates are recommended for use only on open top, or half core boxes. They are manufactured in any size to suit the bottom dimension of the sand magazine.

Write for Illustrated Folder

WM. DEMMLER & BROS., KEWANEE, ILLINOIS

Manufacturers of Core Blowers Exclusively Since 1911

SPECIFICATIONS

BRASS SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

The brass slotted vents have thick heads, so that they may be used in round or curved core box surfaces, and the heads scraped to conform to the contour of the box. Very fine sand requires the use of vents with .010" slots, but .015" slots may be used, with the usual lake sand core mixtures.

STEEL SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

The steel slotted vents have thin heads, to make them easy to keep clean, and are preferable for use in flat surfaces of core boxes. They are hard chrome plated to prevent rust.

SCREEN TYPE CORE BOX VENTS

Mesh: #30, #40, #50

Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

Screen type vents provide maximum ventilation, and are preferred by many of our customers for this reason. Coarse screen vents may be used in core prints, where it does not matter if the vent leaves a slight mark on the core. They are also useful in vented plates used under core boxes which are open at the bottom.

DELTA NO-VEIN COMPOUND

EVERY DELTA Foundry Product is backed by continuing and exhaustive laboratory research to safeguard quality and maintain absolute uniformity. From raw materials to the finished product manufacturing processes proceed under an automatic and persistent policy of laboratory control.

DELTA FOUNDRY PRODUCTS CUT PRODUCTION COSTS

CORE AND MOLD WASHES:

FOR ALL TYPES OF SAND CAST METALS: STEEL, GRAY IRON, MALLEABLE AND NON-FERROUS.

●

PARTING COMPOUNDS

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MUDDING & PATCHING COMPOUNDS

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NO-VEIN COMPOUND

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MOLD SURFACE BINDERS — LIQUID

●

PERMI-BOND

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DRI-BOND
(DRY BINDER)

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BONDITE

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96-B SAND RELEASE AGENT

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CORE ROD DIP OIL NO. 224X

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SAND CONDITIONING OIL

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CORE OILS

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Ends VEINING AND METAL PENETRATION IN YOUR CORE SAND MIXES

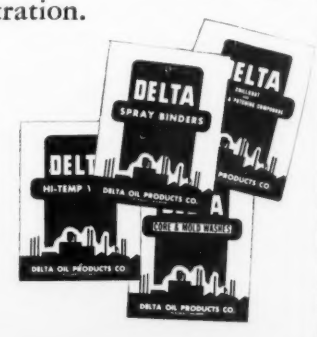
Add only a small quantity of DELTA NO-VEIN COMPOUND (1% to 3% maximum) to your core sand and eliminate troublesome veining of cores.

DELTA NO-VEIN COMPOUND is a specially prepared and compounded series of oxides which develop the necessary plasticity and hot strength without, in any way, deteriorating the sand.

DELTA NO-VEIN COMPOUND retards sand grain expansion, practically eliminating the possibility of metal penetration.

Get the Facts...

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.



DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

Clean up castings FASTER with the

CLECO

1480-A PNEUMATIC EDGE GRINDER

USES INCLUDE: cutting gates and risers off stainless and chrome vanadium castings, cleaning up welds (especially stainless welds) and foundry finishing operations on monel, stainless steel, etc.

Many grinding and cutting jobs that were tedious and expensive by older methods are made easy and economical with the Cleco 1480-A Edge Grinder. Many users report that jobs which were formerly difficult on a production basis are made easy with the Cleco 1480-A. In some instances the 1480-A paid for itself in less than six weeks.

If you are grinding or cutting monel or hard alloy steel you owe it to yourself to find out what the Cleco 1480-A will do. Give us the particulars of your problem. A Cleco Field Engineer can help you solve it — without obligation.

CLECO AIR TOOLS

PNEUMATIC TOOLS EQUIPMENT ACCESSORIES DALLETT

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No. MM 421
Specifications
(Once the "Specs" are established, you can re-order quickly by code number — certain that every wheel will be exactly the same — job-fitted — a perfect match for the needs of your work.)

On Grinding Wheel "Specs"

You know the results you want in your grinding. Besly-Titan is organized to formulate wheels which will do it *your* way—fitting the requirements of the job with wheel specifications that will do it . . . material, wheel-speed and innumerable other factors considered. That's what we call *job-fitting*. Sounds like a luxury . . . but *job-fitted* Besly-Titan Wheels *cost you no more* than "stock" wheels—and delivery in just a few days is an organized routine.

Free-cutting, long-wearing Besly-Titan Abrasive Wheels and Discs are accurately bonded to snag or finish at grinder speeds available in your foundry. You'll find they save time, labor and materials on every operation.

You'll want to check the production and quality-boosting possibilities of this set-up . . . Write for complete information and individual formula recommendations, including Trial Order Plan.

BESLY-TITAN

ABRASIVE WHEELS AND DISCS

Are "Job-Fitted" for the Foundry

BESLY-TITAN

BESLY-WELLES CORPORATION

Established as CHARLES H. BESLY and Company in 1875

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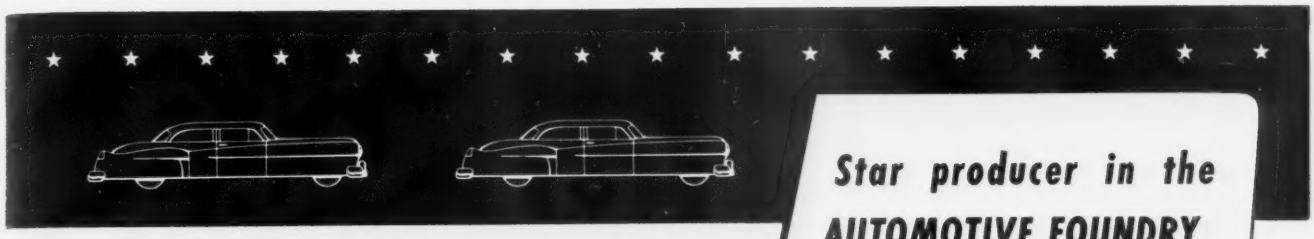
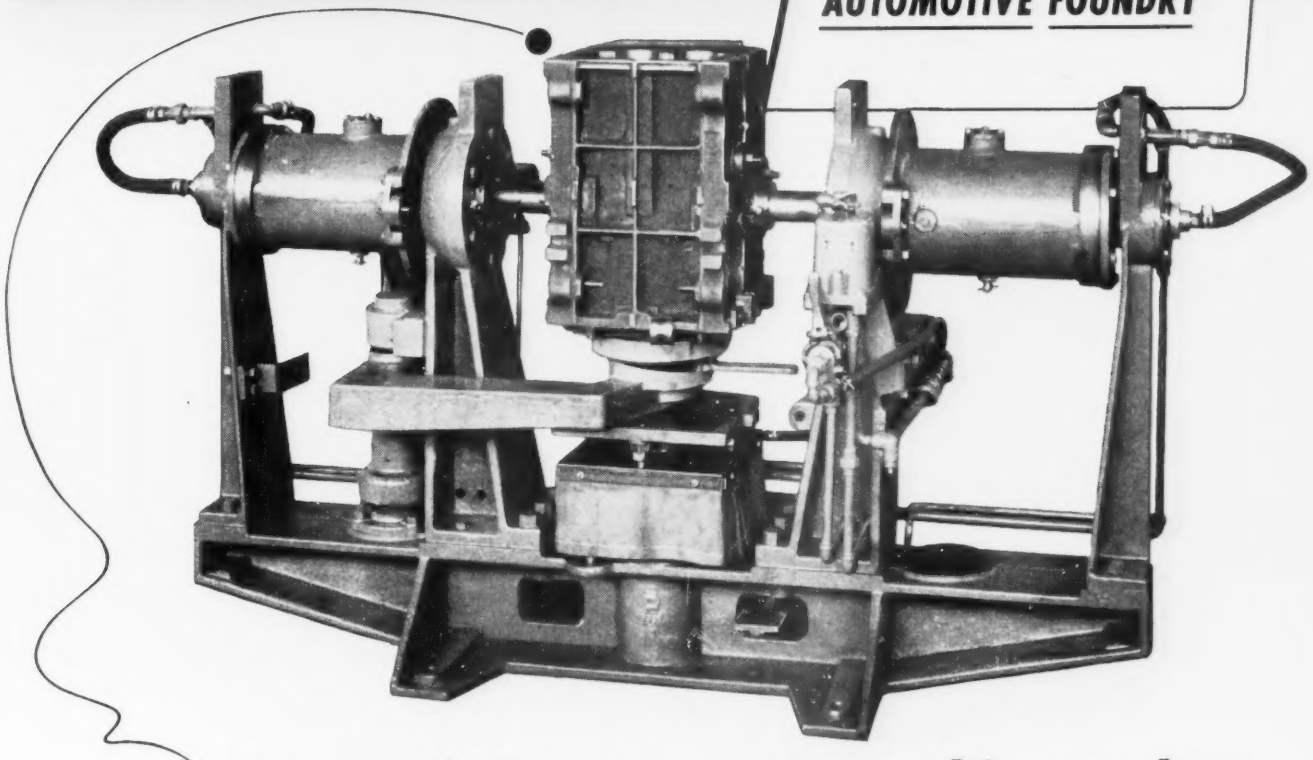


Star producer in the AUTOMOTIVE FOUNDRY



There's little or no wear on this core box

This machine makes barrel cores in pairs for cylinder blocks. It is one of a battery of 80 in the foundry of a major motor car manufacturer. It's a prime example of the *big pay-off* when you dump your molding machine problem in the laps of Tabor design engineers.

Here's a run-down in this particular case:

Compared to the core-making system employed pre-Tabor, core box wear is now at the irreducible minimum. Quite a factor, too, for these core boxes cost about $2,000 each.

A difficult draw is made easy. Deep cut-backs on the sides of the core are taken in stride by a dual application of Tabor's smooth air-on-oil drawing technique.

Labor situation is eased. Under the previous system it took about 90 days to train a coremaker. With the machine, a raw candidate is proficient in 3 days.

So count twice on Tabor. (1) to take care of your standard molding machine needs; (2) to "design around" any special problem that confronts you.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

EXPORT DEPARTMENT, 765 DREXEL BLDG., PHILA. 6, PA.

REDUCE EXHAUST AIR WITH CONTROLLED VENTILATION

Balanced Air Supply Saves Money

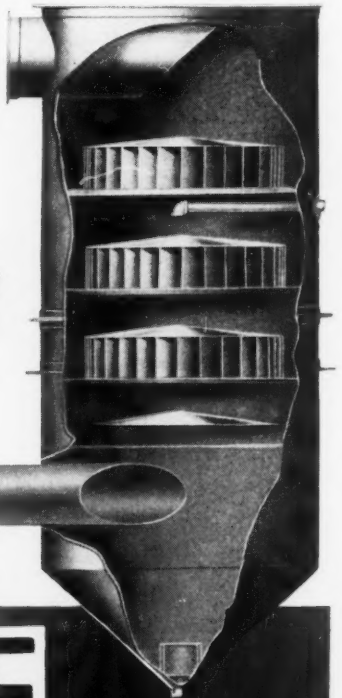
Lavish use of exhaust air can be expensive. When excessive volumes are used an unbalanced condition results in the foundry, setting up unwanted air flow patterns and causing waste of needed plant air.

Schneible "Compensating Air" hoods are designed with controls that allow the proper volume of supply air from either inside in summer to remove hot, dead air from under the roof, or outside in winter to conserve wanted power plant heat. Exhaust air volumes are also regulated to maintain building ventilation balance and more efficient use of all air.

Your local Schneible engineer has detailed information that will enable you to cut ventilation waste and save money—or write direct to

CLAUDE B. SCHNEIBLE COMPANY
P.O. BOX 502, ROOSEVELT ANNEX, DETROIT 32, MICH.

MULTI-WASH COLLECTORS available from 1000 to 36,000 c.f.m. for all dust, fume and smoke control applications.



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BULLETIN NO. 450

The latest information on standardized Schneible Uni-flo Hoods for Shakeouts, Pouring Stations and Mold Conveyors is now available for your files.

This comprehensive 16-page two color catalog includes pictures of each type of hood, tells how it functions and its outstanding features.

U. S. and Foreign Patents Pending.

SCHNEIBLE

Late Foundry News

DECEMBER 24, 1951

PRESSURE ON SCRAP: The push continues to get ferrous and nonferrous scrap moving to foundries, steel mills and ingot makers. Manly Fleischmann, DPA administrator, has threatened to put the government in the scrap business if private industry can't collect enough iron and steel scrap. Putting the finger on the country's most lucrative potential source of scrap, NPA issued Order M-92, which is supposed to flush out about 2 million tons from auto wrecking yards by mid-March. Government-held surplus stocks of nonferrous scrap (currently estimated at 2000 tons) will be made available to industry instead of being transferred to the strategic stockpile. NPA, in attempting to speed up flow of aluminum scrap, has amended Order M-22 to stimulate the turnover of dealer receipts, and in a new directive limits the amount of tolled and purchased scrap and secondary ingot primary producers may receive during the first quarter. Meanwhile, shipments of secondary aluminum ingot are tending upward. October deliveries of 22 million pounds were nearly one-fourth larger than September's.

STEEL CASTINGS: NPA advisory committees of the steel castings industry and the high-alloy steel castings industry have requested deletion of their products from the list of controlled materials under CMP. The latter at a recent meeting pointed out that the NPA "melt sheet" system and allocation of scarce alloys are sufficient to apply to high-alloy steel castings. Members also declared that requests of the industry for tax amortization certificates for proposed plant expansion have been largely ignored by NPA and DPA despite the highly essential character of their products in the defense program. Another recommendation was that the Castings Section of the Iron and Steel Division, which in addition deals with problems of gray iron and malleable iron casting producers, should be raised to the position of a division branch.

BUILDERS HARDWARE: First quarter allotments of copper-base alloy castings to builders hardware manufacturers have been cut to 800 tons by NPA. This compares with 1000 tons in the fourth quarter and 1400 tons in the third quarter last year. Allotments of aluminum (all forms) were raised to 1300 tons, against 850 tons in the fourth quarter and 1350 tons in the third quarter.

MALLEABLE STATUS: NPA's "List of Basic Materials and Alternates" classifies malleable iron castings in Group 1 (materials for which the supply is insufficient for defense and essential civilian demands). Reclassification is expected to be made to Group 3 (materials in fair to good supply and which should be used as alternates for scarcer materials whenever possible.) Malleable Founders' Society points out that defense orders for malleable castings have not yet taken up the slack resulting from the decline in civilian business and that, in certain instances, the industry's products can be furnished as alternates for more critical materials.

STEEL SCRAP PRICES: OPS has amended the iron and steel scrap price regulation (CPR 5), effective Dec. 24, reducing the ceiling on so-called hard steel scrap $2 a ton. On Oct. 16 it was fixed at $5 above ceiling levels for the base grade (No. 1 bundles) but applicable only when shipped to a gray iron foundry requiring such material. However, it was found that certain foundries not necessarily requiring hard steel were purchasing large tonnages, diverting supplies from gray iron plants urgently needing this material. Under the amended regulation consumers desiring to purchase hard steel scrap must apply to OPS for permission to pay the established premium ceiling price, which now is $3 above the base grade.

EASTERN CLAY SOLD: International Minerals & Chemical Corp., Chicago, has acquired Eastern Clay Products Inc., Jackson, O., which will be known as its Industrial Minerals Division. Norman J. Dunbeck, recently vice president and operating head of Eastern Clay Products, has been elected a vice president of International in charge of its new division.

PATTERN REGULATION: Specially tailored price regulations are being prepared by OPS for a number of commodities originally included in CPR 30 (Machinery), which became effective Dec. 19. Among these are patterns and permanent molds. Until the new regulations are issued manufacturers affected may continue to operate under the General Ceiling Price Regulation.

FOUNDRY EXPANSION: Latest announcement of approved certificates of necessity for accelerated tax amortization of new or expanded defense facilities (including approvals to Nov. 23) includes these foundries and indicated value of expenditures: Falk Corp., Milwaukee, $300,000; Dianne Enterprises Inc., South Gate, Calif., $38,338; Adirondack Foundries & Steel Inc., Watervliet, N. Y., $80,000; General Steel Castings Corp., Eddystone, Pa., $268,001; Dayton Malleable Iron Co., Ironton, O., $183,940; Induction Steel Castings Co., Detroit, $136,200; Michigan Steel Castings Co., Detroit, $654,653; Madison Foundry Co., Cleveland, $85,500; Wehr Steel Co., Milwaukee, $23,765; Riverside Foundry Inc., Bettendorf, Iowa, $615,000; Missouri Steel Castings Co., Joplin, Mo., $88,900; General Metals Corp., San Francisco, $195,694. A summary of certificates approved by DPA through Oct. 19 includes 81 foundry projects representing a proposed investment of $51,419,000. Steel foundries head the list with an investment

of $26,155,000 at 34 plants, followed by 13 malleable foundries with $11,044,000, 18 gray iron plants with $10,402,000, and 16 malleable foundries with $3,818,000.

USED EQUIPMENT: A new price regulation (CPR 105) issued by OPS covers sales of used industrial and construction machinery and related equipment, including foundry equipment. Effective Dec. 17, it applies a ceiling price for rebuilt and guaranteed equipment at 85 per cent of the base price for the same or similar new equipment. For equipment not rebuilt and guaranteed the ceiling is 55 per cent of its applicable base price. However, in either case a ceiling may be determined under a depreciation method which, in the case of foundry equipment, allows a 5 per cent annual depreciation from the base figure. If the depreciation method is used the resulting price may not be more than 80 per cent of the base price.

PERSONAL: Edmund J. Burke, on leave from Hanna Furnace Corp., Buffalo, has been added to the staff of E. J. Hergenroether, assistant director for metallurgy and conservation, NPA Iron and Steel Division . . . Timothy A. Lynch, one-time vice president of Reynolds Metal Co., has been named director of the Aluminum and Magnesium Division, NPA. Acting director since last Sept. 1, he succeeds Nigel H. Bell . . . Walter H. Wiewel, on leave as vice president of sales, Crucible Steel Co. of America, Pittsburgh, has been appointed assistant administrator of NPA, in charge of the Metals and Minerals Bureau. He succeeds Norman K. Foy, Republic Steel Corp., Cleveland, formerly head of the bureau, and S. B. Coolidge, Sherwin-Williams Co., Cleveland, recently acting assistant administrator . . . Arthur J. Kerr, on leave as vice president of the Rockwell Mfg. Co., Pittsburgh, succeeds Eugene F. McCarthy, vice president, Beals, McCarthy & Rogers Inc., Buffalo, as director of the General Components Division, NPA.

MISCELLANY: Shipments of castings in 1951 set a new record—approximately 19 million tons valued at nearly $5¼ billion . . . Great Britain will divert 11,000 tons of Canadian aluminum to this country the next several months. During the same period this country will divert German iron and steel scrap (28,500 tons); 25,000 tons of finished steel products will be allotted, and British orders will be accepted for 46,000 tons of conversion steel ingots . . . First quarter allotments of structural steel to foundries and steel mills represent 72.4 per cent of their stated requirements. Aircraft plants will get nearly 100 per cent, general industrial equipment only 62.6 per cent. Allotments for all purposes represent about 60 per cent of indicated needs . . . Small Defense Plants Administration has opened new headquarters in the Old Washington Post Building, 1337 E St. N. W., Washington.

PRICES OF FOUNDRY METALS AND COKE

(As of Dec. 24, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	21.30
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis (delivered)	25.40
Swedeland, Pa.	22.60
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	55.25	55.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—27.25c; 88-10-2—38.50c; 80-10-10—32.25c; No. 1 yellow—23.25c.

ALUMINUM: 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 19.50c. Deoxidizing grades: No. 1 18.00c; No. 4 16.50c.

MAGNESIUM: 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 24.50c, Connecticut valley; Lake 24.62½c, delivered.

ZINC: High grade 20.85c, delivered. Die casting alloy 23.65c-24.25c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Bundles	Cast Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$44.00	$39.00	$41.50	$39.00
Buffalo	43.00	48.00	43.00	45.50	43.00
Chicago	42.50	47.50	42.50	45.00	42.50
Cincinnati	43.00	48.00	43.00	45.50	43.00
Cleveland	43.00	48.00	43.00	45.50	43.00
Detroit	41.15	46.15	41.15	43.65	41.15
Eastern Pa.	42.50	47.50	42.50	45.00	42.50
Los Angeles	35.00	40.00	35.00	37.50	35.00
Pittsburgh	44.00	49.00	44.00	46.50	44.00
San Francisco	35.00	39.00	35.00	37.50	35.00
St. Louis	41.00	46.00	41.00	43.50	41.00
Seattle	35.00	40.00	35.00	37.50	35.00

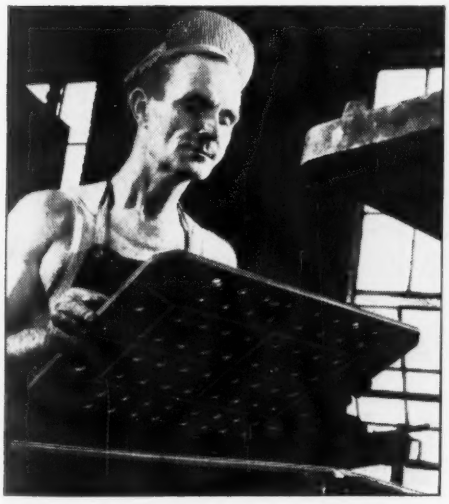
Above delivered prices are ceiling levels at basing points indicated. *Applies to dealer and industrial scrap; No. 1 and No. 2 heavy melting steel are $1 less; No. 1 railroad heavy melting is $2 higher. **$2 higher if 1 ft or under. $3 higher when steel 2 ft or under is sold to a gray iron foundry but OPS permission required to pay premium price.

CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

"EDCO BOTTOM BOARDS eliminate swelled castings"



Above photo shows Mid-City Foundry Company molder placing EDCO DOWMETAL Bottom Board on flask preparatory to pressing. Mid-City Foundry produces high quality gray iron and alloy castings.

Take a tip from E. F. Dublinski. He speaks from experience in saying —"EDCO DOWMETAL Bottom Boards eliminate swelled castings". Since switching to magnesium boards, Mid-City Foundry does not have castings ruined through swelling caused by depressions burned into out-dated wood boards.

EDCO DOWMETAL Bottom Boards help produce castings that are true to pattern. The exclusive grooved and vented design permits escape of gasses, and insures mold stability. Causes for rejects are kept to a minimum.

"We consider EDCO DOWMETAL Bottom Boards as permanent equipment at Mid-City," adds E. F. Dublinski, "because they'll outlast wooden boards at least 30 to 1 and in no time at all pay for themselves."

Your molders will like handling these boards because they are light in weight, easy to stack, and there's no danger of splinters. EDCO DOWMETAL Bottom Boards will not warp or rot—there are no nails to come out, nothing to break or split—no upkeep.

Write us, or phone CApitol 7-2060 for price schedule and list of 74 standard sizes available from stock.

CHRISTIANSEN CORPORATION

1517 N. KILPATRICK AVENUE • CHICAGO 51, ILLINOIS

Aluminum Alloy Ingots • Zinc Base Casting Alloys

HIGH FREQUENCY INDUCTION FURNACES such as this are lined to last with Norton RM1169 MAGNORITE* refractory cement.

Melt More Metal Per Lining

. . . with Norton refractory cements

Whether you are melting ferrous or non-ferrous metals, you will find it worth your while to use Norton refractory cements, available in a wide range of mixtures for a variety of applications.

Norton RM1169 MAGNORITE refractory cement, for instance, is widely used for lining high frequency induction furnaces which melt stainless steel and refractory alloys. It has a maximum-use temperature of 3250° F.

Norton RC1188 CRYSTOLON* refractory cement is popular for lining and patching crucible melting furnaces and reverberatory furnaces which melt brasses and bronzes. It has a maximum-use temperature of 3050° F.

Norton RA1144 ALUNDUM* cement makes long-lasting linings for indirect and direct arc furnaces in many ferrous and non-ferrous metal-melting jobs. It has a maximum-use temperature of 3150° F.

For detailed description of the twenty applications of Norton cements in metal-melting furnaces — as well as other uses for these long-lasting refractory cements — send for Bulletin 863. NORTON COMPANY, 306 New Bond Street, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON

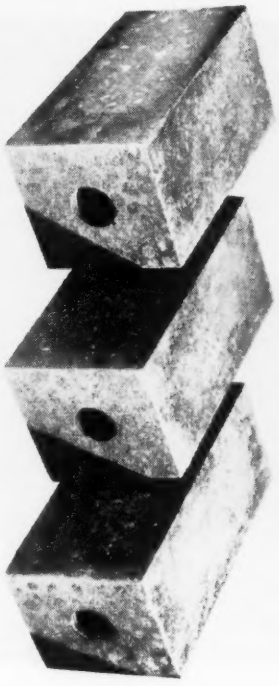
Special REFRACTORIES

Making better products to make other products better

Canadian Representative

A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

These long-lived slag hole blocks



help cut down campaign interruptions

Norton CRYSTOLON slag hole blocks hold their hole size from 8 to 30 hours, resist slag action 5 to 15 times longer than fire clay blocks. No softening, spalling, cracking at temperatures as high as 3050° F. More and more foundries are avoiding campaign interruptions, getting more production per shift by specifying Norton CRYSTOLON for their slag hole blocks.

See for yourself!

Compare the performance of Norton CRYSTOLON slag hole blocks with blocks you are now using. Give them a workout in your cupolas. For prices or complete information, see your nearby Norton representative or write us direct.

NORTON COMPANY
306 NEW BOND STREET
WORCESTER 6, MASS.

The Fast Way is the Cheapest Way to Make Cores

YOU PAY NO PREMIUM for speed. In fact, you get bonuses all the way. First, you cut handling time. Here's how: In conventional core making practice, cores are placed on a collecting rack; they are then removed and placed in an oven. The hot, smoking cores are removed by asbestos gloved workers and placed on a cooling rack. From there they go to storage.

Using a *Foundromatic* dryer — core makers simply place the green cores on the moving belt of the dryer. In a few minutes they come out — cool enough to handle with bare hands and ready to use . . . a big saving in handling and baking time!

Next, you cut up to 60% fuel cost. All the heat goes into the core — none into the room. Warmup time is short and this new *Foundromatic* dryer can be turned off when it's not being used.

In addition, core quality is improved. Over-baking of cores is impossible . . . burning of fins or thin sections is ended.

Cores that will pass through an aperture 36 inches wide and 13 inches high can be dried in the *Foundromatic* sand core dryer. For details, call your nearby Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Foundromatic is an Allis-Chalmers trademark.

THE CORE BOX
Questions and Answers About Dielectric Sand Core Drying

1. Do I need an electronic engineer to help me with the *Foundromatic* dryer?

No. Once equipment is installed and operating, any personnel can be quickly trained to follow simple operating instructions.

2. How long will tubes last?

Tubes have an estimated life of 5000 hrs.

3. How much maintenance is there?

Very little. Periodic replacement of tubes; oiling of rollers, and conveyor and blower motors.

4. Why is oven separate from heater?

To eliminate possibility of evaporated moisture being deposited on heater parts causing arcing, and to simplify installation and maintenance.

5. Can capacity be increased by adding another heater?

Yes. Simply add heater with minor oven changes.

6. How does the core dry?

By passing high frequency currents through the moist sand the molecules are set in motion and the resultant friction generates sufficient heat to drive off the moisture from the center to the outside.

7. What about collapsibility?

Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

8. Can core wash be eliminated?

In many cases, yes. The resin forms an atmosphere conducive to smooth castings.

9. Does the *Foundromatic* core dryer use power when empty?

No. Industrial heaters inherently deliver no power unless material is between the electrodes.

10. Why are rubber or fabric belts used?

Arcing is reduced, cores are given a smoother ride, and the low loss material requires no heat.

ALLIS-CHALMERS
MILWAUKEE 1, WIS.
Send me new 8 page Bulletin 15B7306B.

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ALLIS-CHALMERS

CASTFLUX

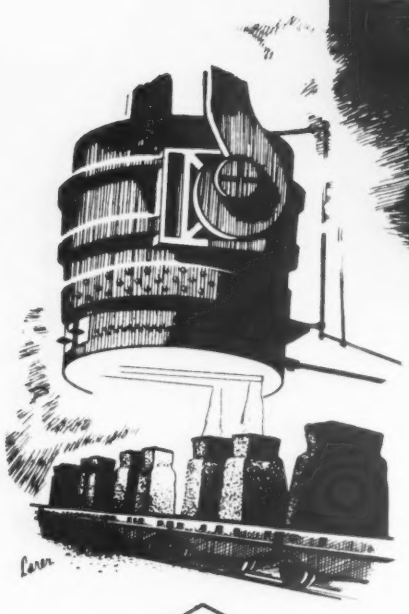
Trade Mark Reg.

The 'National' DUAL-PURPOSE FLUX

CASTFLUX

on blind and open RISERS

CASTFLUX raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.



CASTFLUX

as a 'HOT TOPPING'

CASTFLUX prevents oxidation by keeping the molten steel down into the main body of the ingot, greatly reducing the volume of piping and saving a substantial amount of metal. There is no carbon segregation or pick-up.

CASTFLUX

in the LADLE

CASTFLUX increases fluidity mate by cleansing and purifying the m bringing to the surface occl oxides, gases, slag, dirt, and foreign matter; offsetting the neg factors of inferior scrap and

CASTFLUX is partly — EXOTHERMIC — DEOXIDIZING — and INSULATIN

CASTFLUX **NATIONAL pigment c**

TYPE SB-10

virtually produces

NO *Smoke Fume*

used more and more by steel and iron

FOUNDRIES

to increase yield—
improve production
—at important savings.

CASTFLUX SB-10 is stocked by the following distributors in your market:—

Seattle, Washington. WESTERN FOUNDRY SAND CO.	Phone Alder—0123
Portland, Oregon. WESTERN INDUSTRIAL CO.	Phone East—1511
Los Angeles, California. SNYDER FOUNDRY & SUPPLY CO.	Phone Lafayette—1128
Detroit, Michigan. NATIONAL FOUNDRY SAND CO.	Phone Madison—8156
Elmira, New York F. F. SHORTSLEEVE CO.	Phone—6497

CASTFLUX SB-10,

the anti-piping compound is so revolutionary in its advantages that its tried and proven results have been acclaimed by foundrymen—to become standard usage for foundries large and small, steel mills from coast to coast and in foreign countries the world over.

A nationally known and recognized research laboratory reports that there is absolutely no carbon pick-up at the neck of the riser or casting itself when CASTFLUX SB-10 is used on steel and steel alloys.

CASTFLUX is a partly exothermic compound, for FEEDING HEADS AND RISERS, that virtually does not smoke or create fume. The uniformity of SB-10 has been well established in the industry.

As a LADLE addition it is a wonderful liquidizer—through its cleaning action it de-oxidizes and degasifies the metal.

unconditionally GUARANTEED

Unless Castflux SB-10 meets with your full approval, material can be returned at no expense within 30 days.

Write for complete details and prices

CASTFLUX

The 'National' DUAL-PURPOSE FLUX

C(2115 East York St., Philadelphia 25, Pa. CASTFLUX

At Bruce Foundry & Mfg. Co., Tecumseh, Michigan, they use only Fremont Flasks and Jackets.

Use Them Once...

and you'll never change

FREMONT MAGNESIUM SLIP FLASKS

Fremont Flasks and Jackets as used at Burt Foundry Co., Toledo, Ohio.

Fremont Flasks and Jackets in operation on the continuous pouring system at the completely mechanized foundry of The Ohio Brass Co., Mansfield, Ohio.

EASIER TO HANDLE

(Magnesium Weighs 1/3 less than aluminum).

LONGER SERVICE

(Magnesium has twice the tensile strength of aluminum). Solid, bolted and welded corner construction.

MORE EXACTING WORK

Accurately machined inside surfaces and flanges. Steel faced top and bottom flanges. The one-inch GROOV-LOCK FOOLPROOF PIN, particularly adapted to cope or drag pattern jobs, guarantees perfect alignment indefinitely. (Other types of standard pin fittings available).

FREMONT CAST IRON OR CAST ALUMINUM JACKETS

MORE ECONOMICAL

Precision machined and drilled, bolted corner construction permits easy insertion of new sides or ends. The entire jacket need not be scrapped. Standard style for ordinary foundry practice. Grooved style, which permits ready gas escape, for steel foundries.

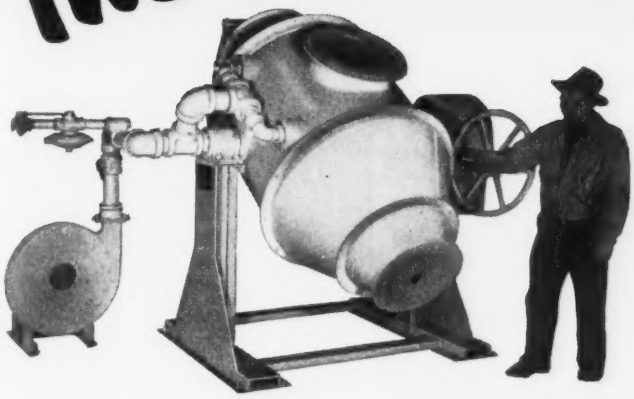
Flasks and jackets can be assembled on 3°, 4° or 5° taper. Write today for literature.

The Fremont FLASK CO

FREMONT, OHIO

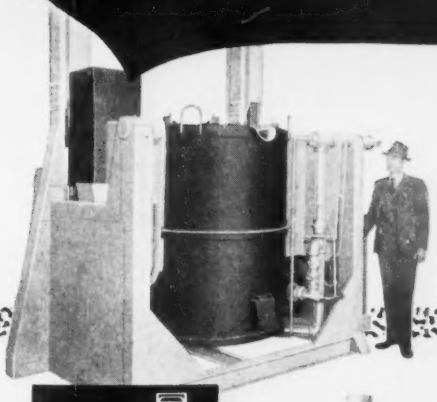
The Foremost Furnaces

for Melting any type of Non-Ferrous Metals in Foundries, Die Casting and Permanent Mold Plants



STROMAN MODEL "BFC" HAND TILT BARREL TYPE MELTING FURNACE FOR ALUMINUM

Featuring "Tangential Firing" which produces a most efficient combustion condition, creating a melting atmosphere that keeps metal loss and dross accumulation at a minimum. Charges through the top or rear door which is also used for drossing metal and cleaning the furnace. Built in 500 lb. capacity and larger. Oil or gas fire.

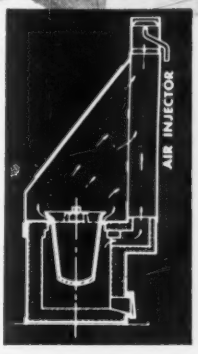


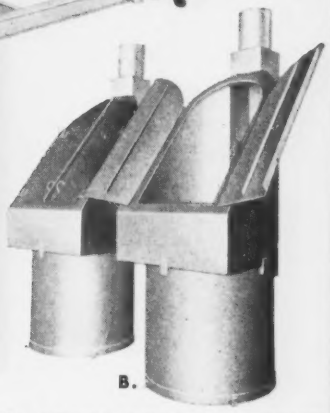
A.

STROMAN MAGNESIUM AND ALUMINUM MELTING AND HOLDING FURNACES

A. Hydraulic Tilt Magnesium and Aluminum melting furnace handling from 500 to 3000 lbs. of aluminum. Incorporates the famous Stroman Stationary Lip Pour, which creates a constant pouring arc at any desired pouring speed. Saves time and metal.

B. Stationary Super-Heating or Melting Furnaces, Type S. F. Designed to deliver the correct super-heat to magnesium after it has been melted in larger furnaces, and before it is poured into the molds. Can also be used for breakdown or holding. They have all safety features. Are available for cast steel pots or fabricated steel pots. Furnaces may be equipped with hoods if so desired, for the venting of combustion and other gasses. Write for bulletin No. 100.





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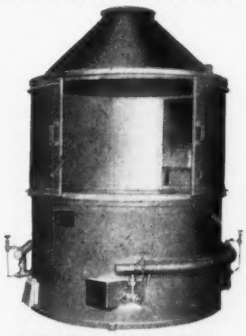

STROMAN IRON POT MELTING FURNACES FOR ZINC OR ALUMINUM

These furnaces are highly recommended as breakdown furnaces for zinc and aluminum die casting and permanent mold plants. They also excel as holding furnaces. They can be supplied either with or without hoods to exhaust fumes and heat. Their construction causes longest pot life and lowest fuel costs. Choice of automatic or manual controls and oil or gas fire. Capacities from 212 to 14,000 lbs. zinc.

Write for Bulletin No. 115

STROMAN HAND TILT CRUCIBLE MELTING FURNACE FOR BRASS, BRONZE, ALUMINUM AND OTHER ALLOYS

Capacities from No. 40 to No. 500 Crucible. Most efficient in operation. Rugged construction assures longest life and trouble-free operation. Oil, Gas or Combination Fire.

Write for Bulletin No. 105

STROMAN TYPE "MC" ALUMINUM DIP-OUT REVERBERATORY FURNACE

Bath capacity from 500 to 10,000 lbs. Aluminum

A combination of breakdown and holding furnaces makes this the most economical furnace ever designed for aluminum melting. It can be used for melting, holding, alloying, fluxing, for either casting or producing ingots. Cold metal does not reach the molten bath. Hot metal is always available for dipping. No iron pots or crucibles to buy. Oil, gas or combination oil-gas fire. Complete automatic controls are available if desired.

WRITE FOR COMPLETE CATALOGUE ON ALL TYPES OF FOUNDRY EQUIPMENT

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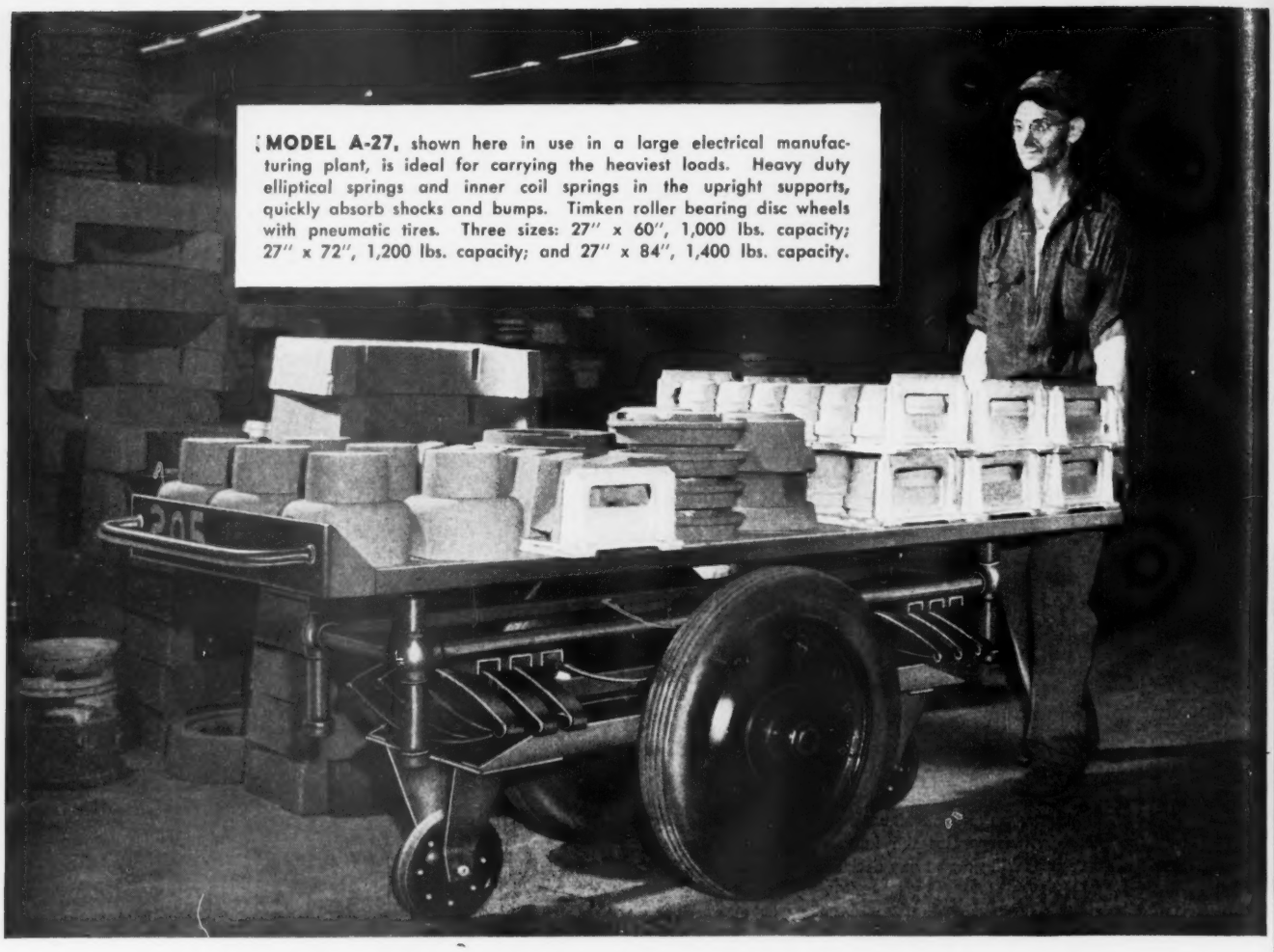


MODEL A-27, shown here in use in a large electrical manufacturing plant, is ideal for carrying the heaviest loads. Heavy duty elliptical springs and inner coil springs in the upright supports, quickly absorb shocks and bumps. Timken roller bearing disc wheels with pneumatic tires. Three sizes: 27" x 60", 1,000 lbs. capacity; 27" x 72", 1,200 lbs. capacity; and 27" x 84", 1,400 lbs. capacity.

Speed-Up Handling-Reduce Breakage

with Labor-Saving

CMD PNEUMATIC CORE TRUCKS

Resilient springs and pneumatic tires combine in these ruggedly built core trucks to *absorb* shocks and bumps *before* they reach the cores. No chafing! No breakage! CMD Pneumatic Core Trucks have been saving money for hundreds of foundries since 1925. They are available in many styles and sizes to meet every requirement with load capacities ranging from 500 pounds to 1400 pounds. They can speed up core handling for you and cut to a new low your losses from core chafing and breakage!

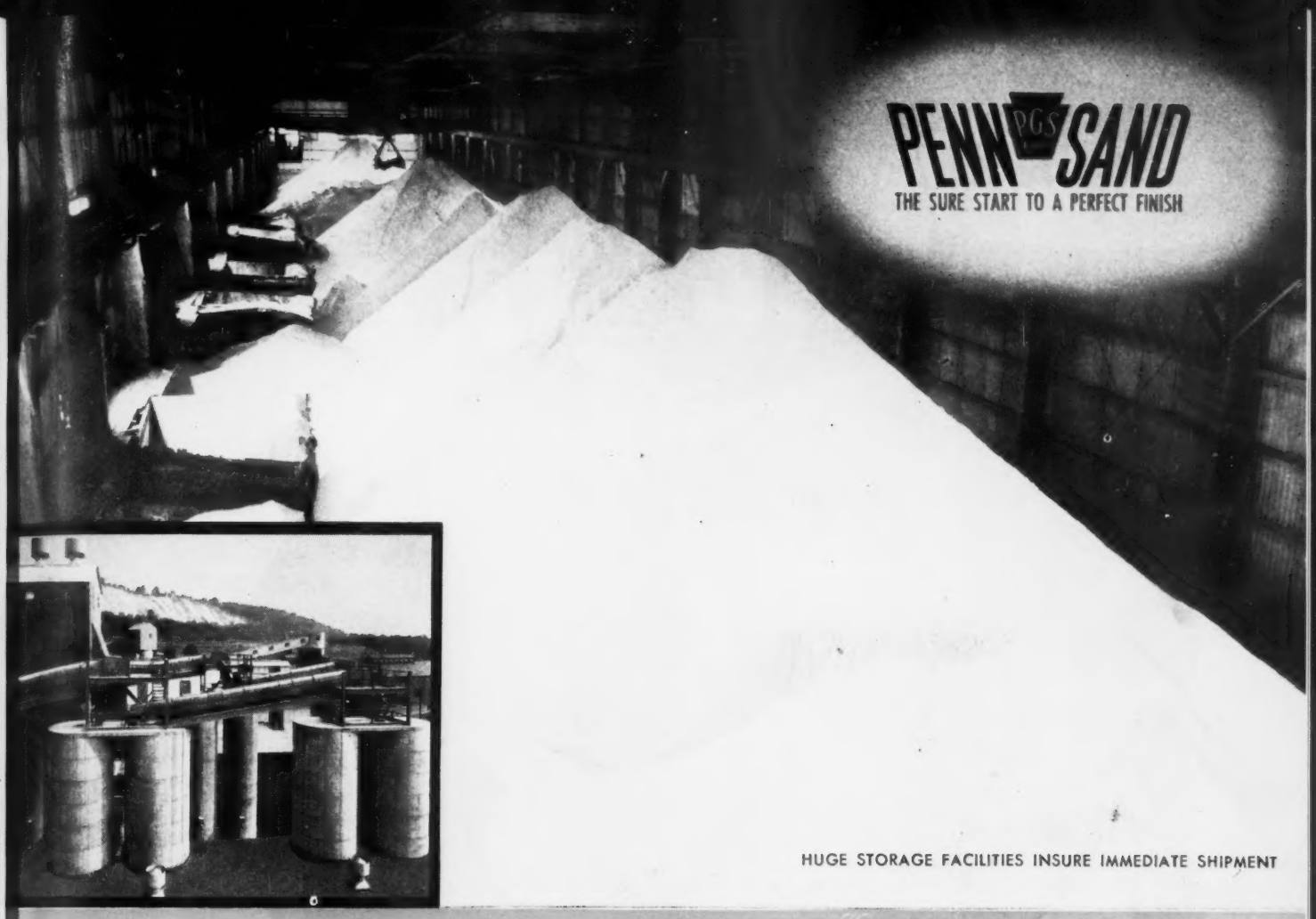
—THE TRUCKS WITH THE "BABY CARRIAGE" RIDE

Write for

FREE CATALOG ON CMD PNEUMATIC CORE TRUCKS, CORE BARROWS AND OTHER FOUNDRY SPECIALTIES

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. 11-F, 1928 West 46th Street **Chicago 9, Illinois**



HUGE STORAGE FACILITIES INSURE IMMEDIATE SHIPMENT

Make better... smoother castings

without sacrificing permeability

Use PENN SAND —a "natural" for your foundry

You can get better finish and higher permeability with the same sand—PENN SAND. Unique grain structure and distribution give PENN SAND built-in lower density, which in turn results in both lower confined expansion and higher permeability. These inherent advantages save you time and money by reducing rat tails, veining, scabbing, buckles and other defects.

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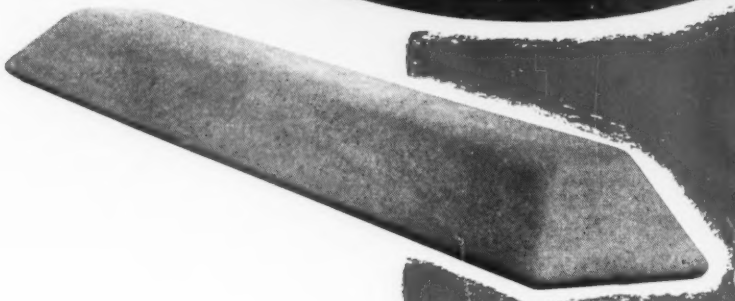

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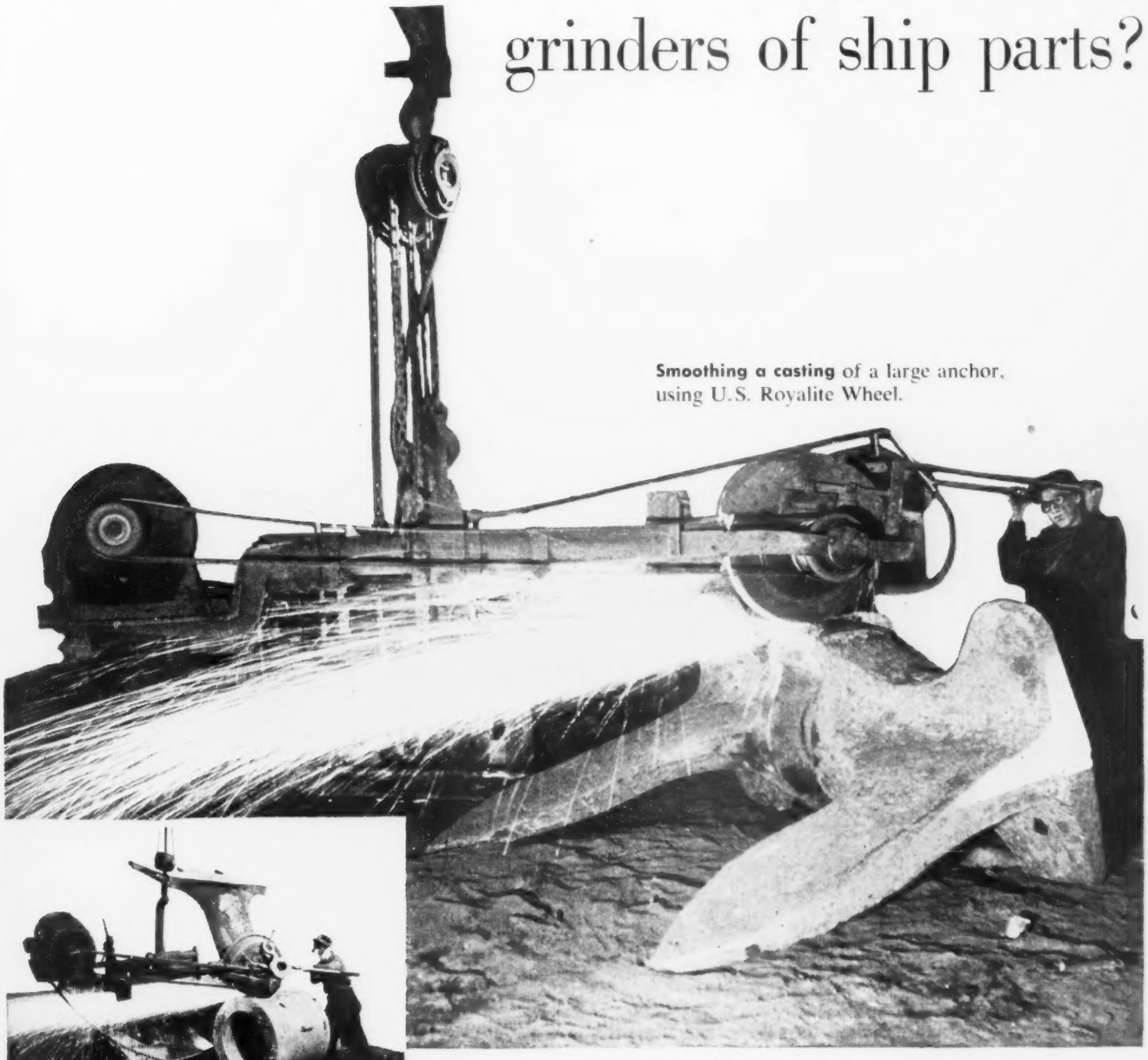

Smoothing a casting of a large anchor, using U.S. Royalite Wheel.

Here a U.S. Royalite® Wheel is being used on intermediate strut for a ship's propeller shaft. In this particular steel foundry, "U.S." Wheels have been used for over 16 years.

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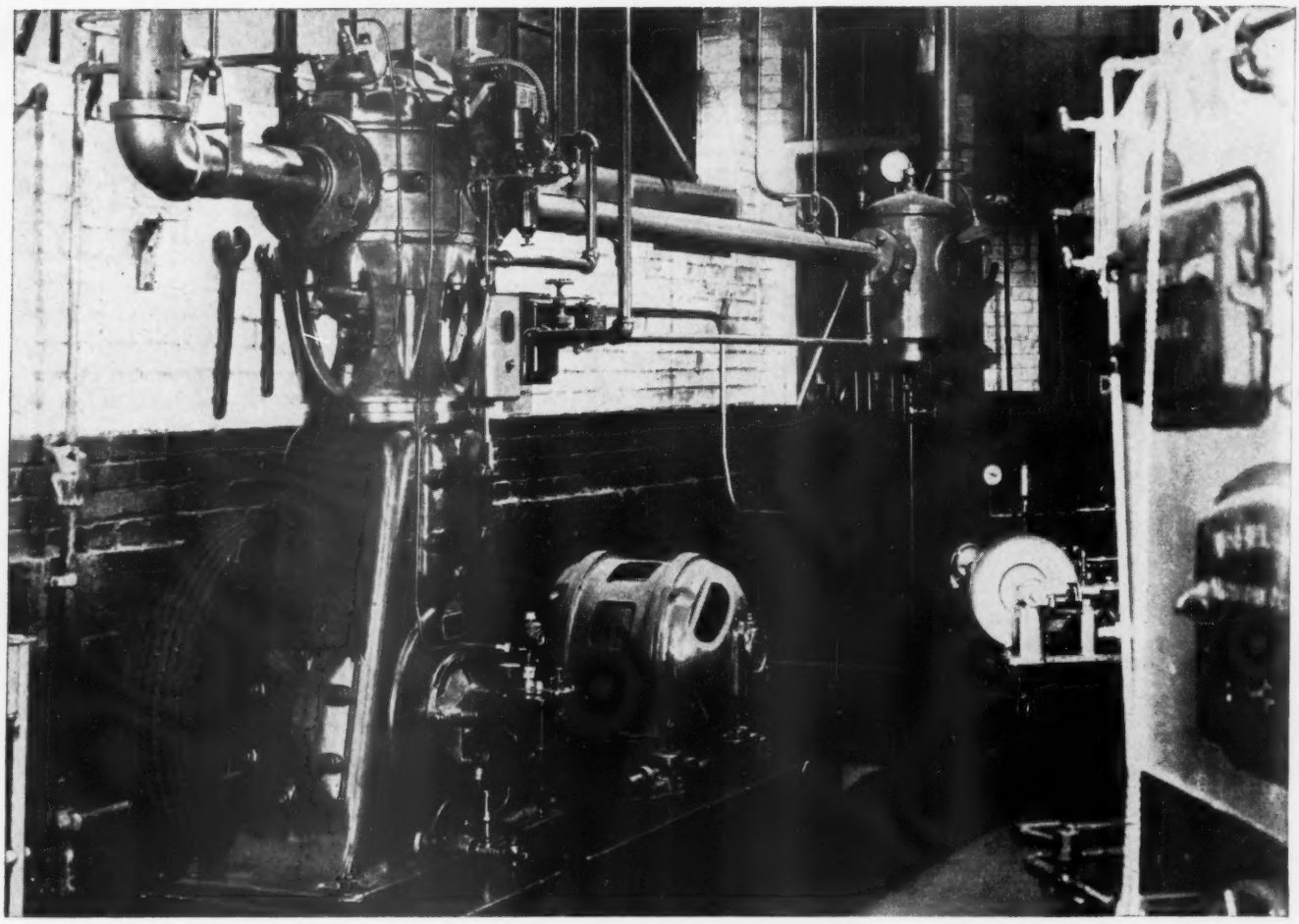

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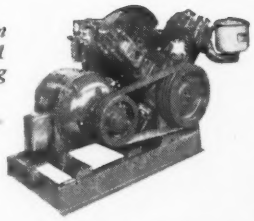
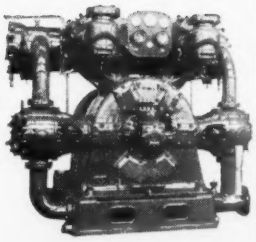
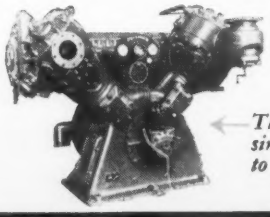


The JOY WN-114, in single or twin units up to 7312 CFM. →





← *The JOY WN-112, in single or twin units up to 3656 CFM.*

Consult a Joy Engineer

W&D 13786

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GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

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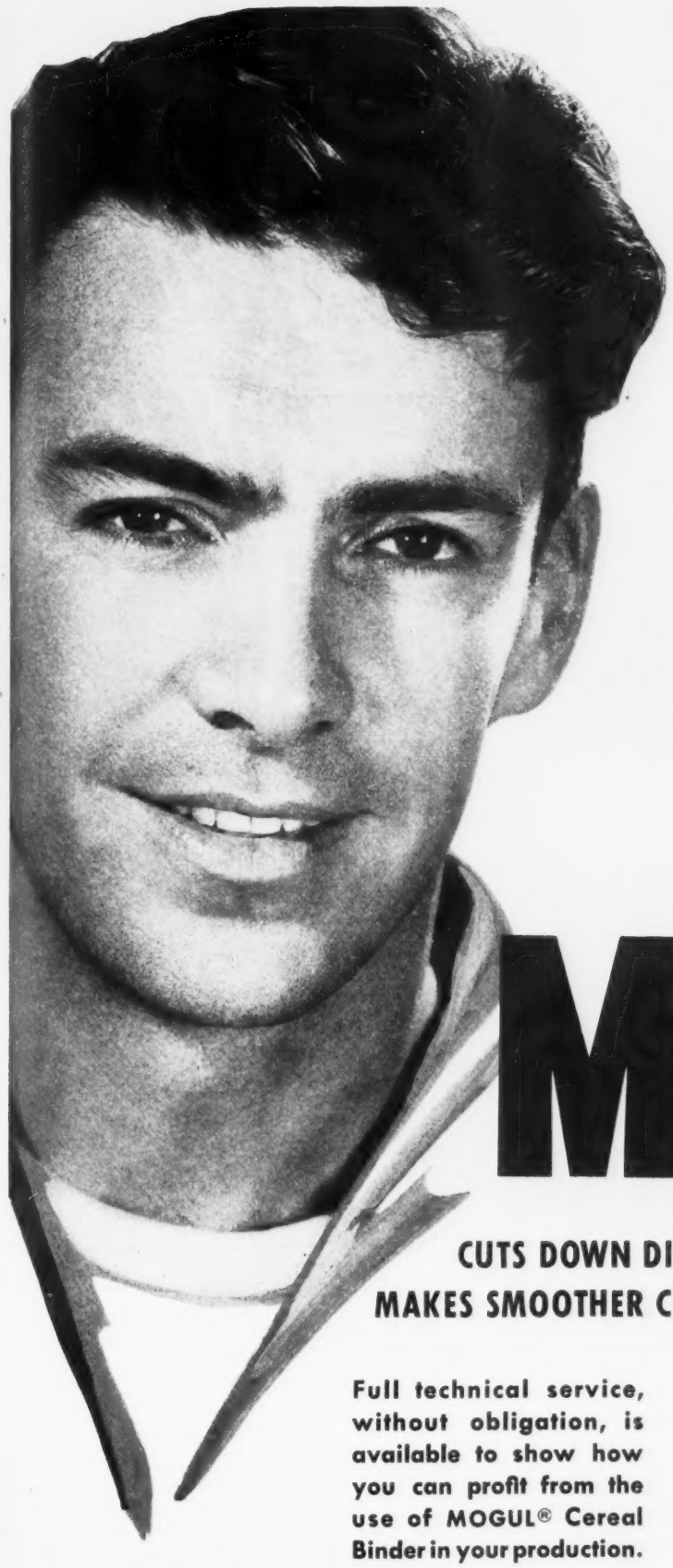

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Herman MOLDING

help make this foundry a good place

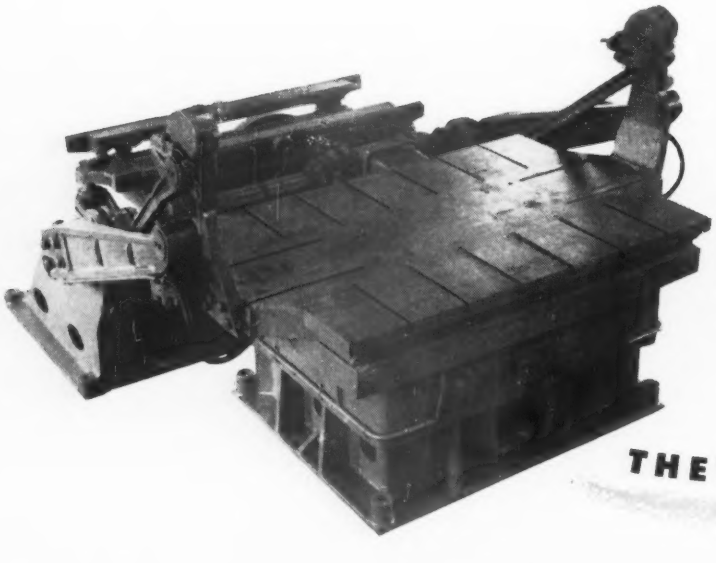
R. F. Maeder
Foundry Superintendent
Whitin Machine Works
Whitinsville, Mass.

because

"We purchased a Herman plain bumper 60" x 72" in 1928. In 1936 we installed two 1500 lb. and one 6000 lb. machines. Since then we have added a 10,000 lb., four 750 lb., two 1,500 lb. and two 3,000 lb. machines. Thus, we now have twelve Herman Roll-over machines operating which gives us the flexibility we need. With these machines we are able to make pattern changes quickly and easily without downtime. Among all our Herman crews, only three skilled molders are used for finishing, core setting, closing and pouring. Herman Molding Machines give us that hard rammed mold so necessary in holding castings to size for accurate jigging."

That's what Mr. Maeder has to say about his experience with Herman Molding Machines

Herman Molding Machines will work for YOU just as well.



THEY'VE MADE THEIR WAY BY TH

The reproduced ad below concerning Whitin Machine Works appeared originally in the June, 1948 issue of FOUNDRY.

MACHINES

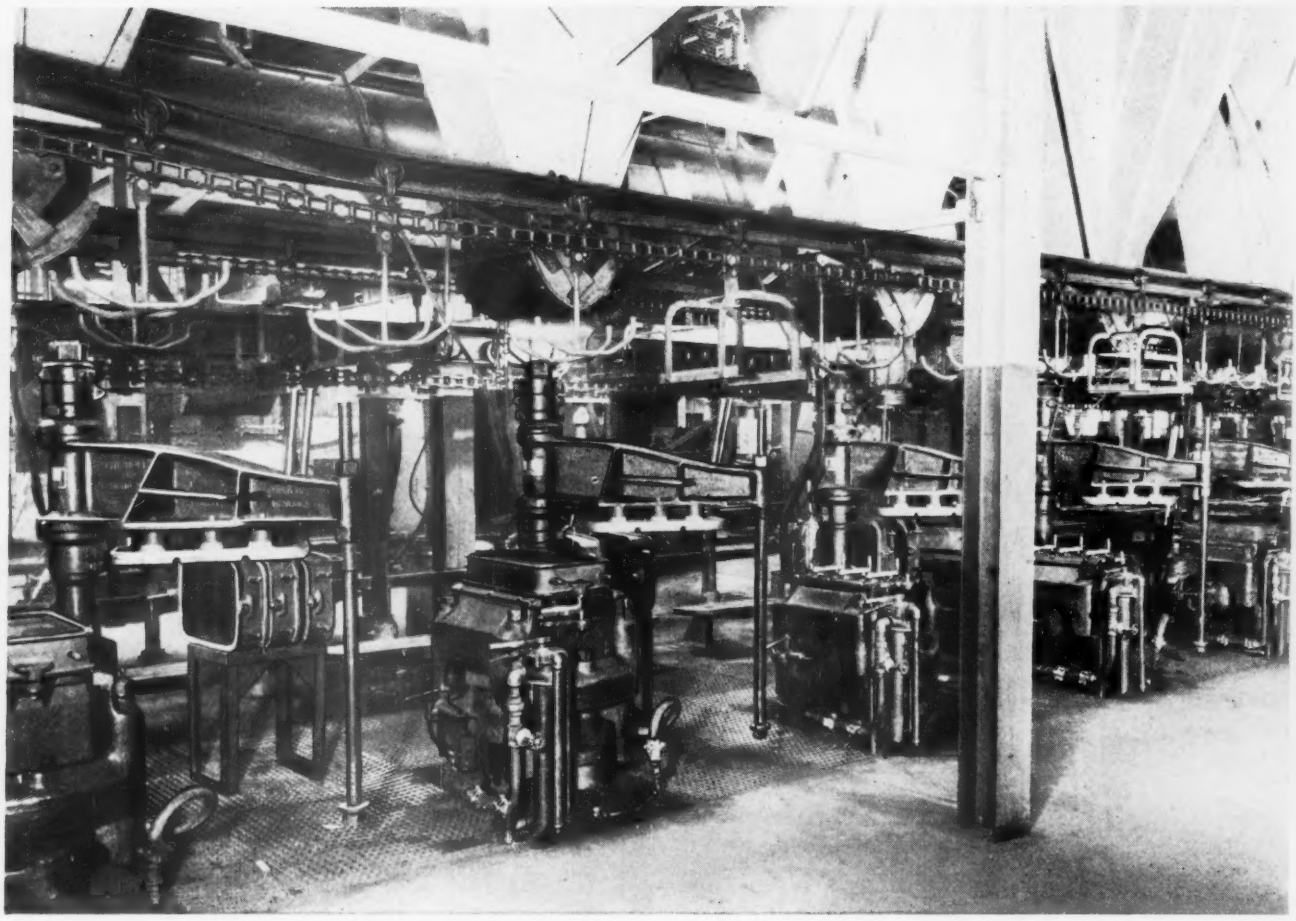
work

This Foundry is a Good Place to Work
Whitin Machine Works
This Massachusetts foundry, established over 100 years ago, is completely equipped for the production of textile machinery castings. It is a good place to work because sound management has kept it abreast of the latest developments in machinery and accessory equipment. Facilities include sand handling and preparation equipment, conveyors and traveling cranes for heavier molds, and cupola control equipment. The company produces an excess of one million castings per month, ranging in weight from less than one ounce to 2000 lbs.
This plant also uses a number of Herman Pneumatic Molding Machines. The 6000 lb. series machine illustrated is simple to operate. After the mold is jarred to proper density, jarring automatically stops by timer control. One valve assures swift, smooth, steady hydraulic action for mold rollover and pattern draw. Pattern draw equalizer adjusts itself to all irregularities in flask or bottom board. For further details of this machine, write the address below.
MOLDING HERMAN MACHINES
HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

AY THEY'RE MADE

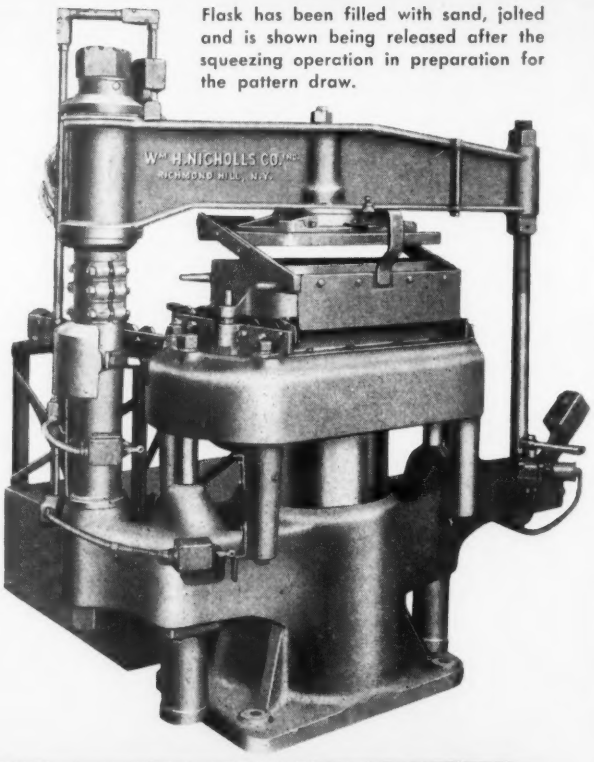
Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



A BATTERY OF NICHOLLS MOLDING MACHINES IN A LARGE PRODUCTION FOUNDRY.

HEAVY DUTY Combination Jolt and Power Squeezer Molding Machines with pneumatic pattern draw and power operated self positioning parallel squeeze head, equipped with electrical controls for single push button automatic operation of jolt, squeeze, pattern draw and cross arm, including automatic sand strike-off, mold pusher and adjustable flask roll-off device.

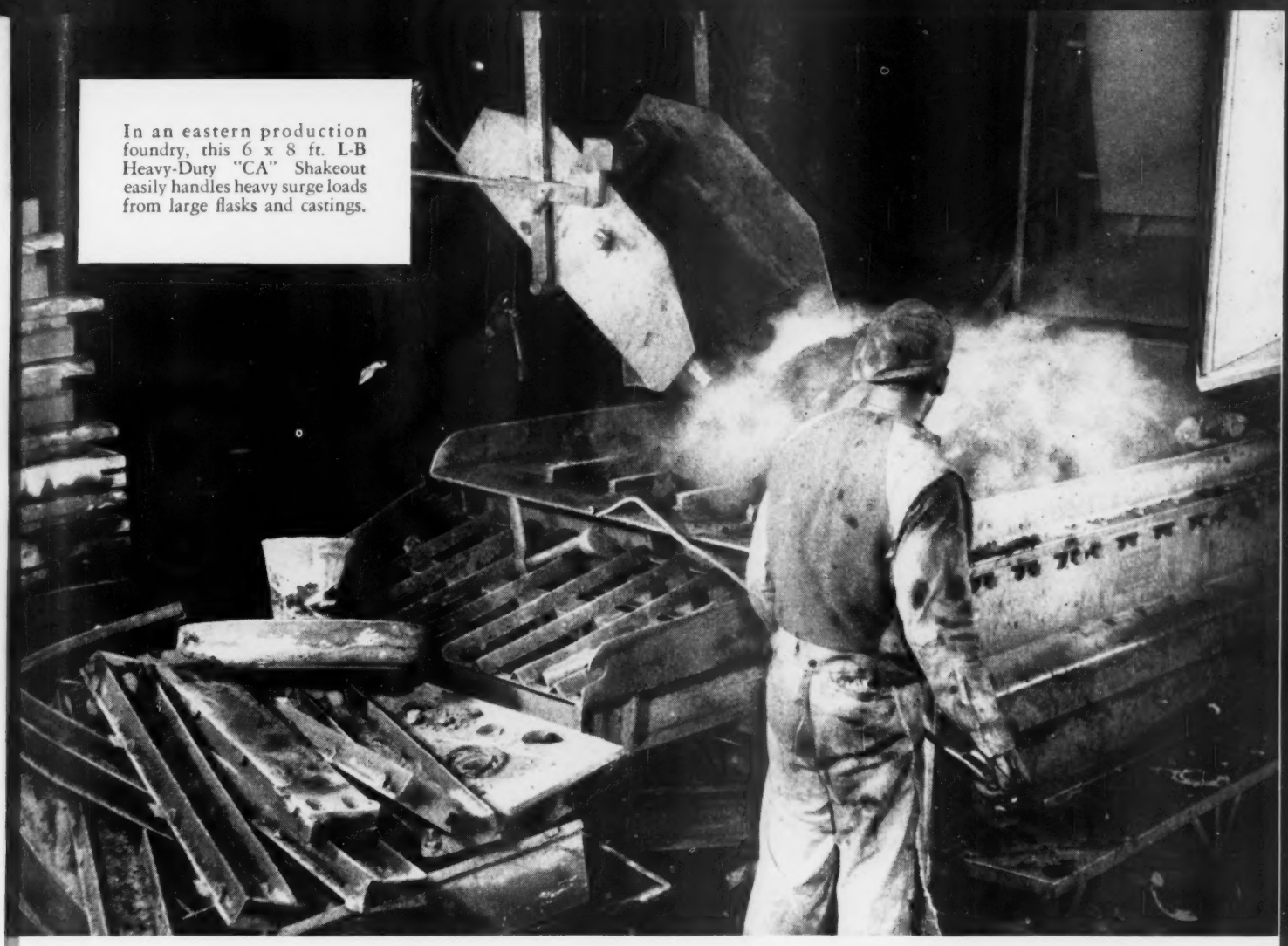


Flask has been filled with sand, jolted and is shown being released after the squeezing operation in preparation for the pattern draw.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL 18, LONG ISLAND, NEW YORK

Established 1910

NICHOLLS

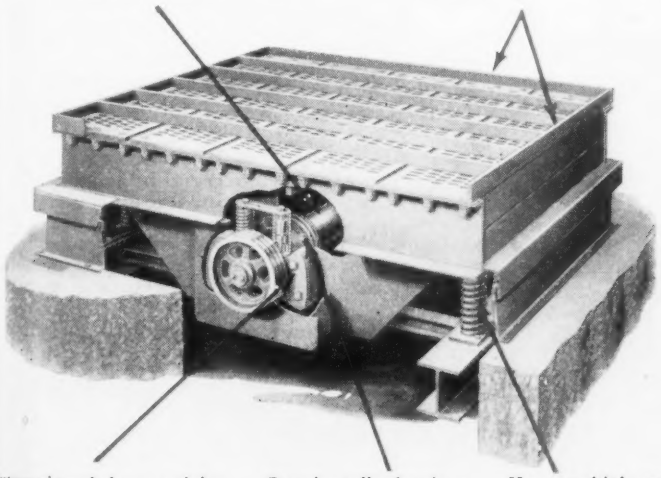


In an eastern production foundry, this 6 x 8 ft. L-B Heavy-Duty "CA" Shakeout easily handles heavy surge loads from large flasks and castings.

Get fast, clean, low-cost SHAKEOUT

Enclosed, full-floating vibrating mechanism has only two bearings, carries no weight from load or deck.

With all operating parts recessed, deck is accessible from all four sides.



Automatic unbalance weights eliminate critical vibration during starting and stopping, are easily adjusted to control amplitude.

Oversize roller bearings are cartridge-mounted for easy inspection and service without dismantling the shakeout.

Heavy multiple steel springs carry all impact forces, assure transfer of full vibration to deck.

LINK-BELT Heavy-Duty "CA" Shakeouts give positive separation of castings and sand

Shakeout is one spot where alert foundrymen save time and money. By eliminating slow, laborious manual shakeout of flasks, output is stepped up. Cleaner castings and improved sand recovery result, and dust control is facilitated.

And when it comes to shakeouts—only with the Link-Belt Heavy-Duty "CA" do you get full-floating, automatic unbalance-weight control. This advanced engineering feature provides smooth, flexible, low-cost operation. Rugged construction and full protection of all moving parts assure minimum maintenance.

Let a Link-Belt foundry specialist give you all the facts. Or you can write for Folder 2338.

LINK-BELT

CONVEYORS and PREPARATION EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,539

For Uniform, Low Cost, Efficient Blast Cleaning

METALLIC

SHOT **HI-GRADE** GRIT

When you buy shot and grit, you buy a promise of uniform, low cost, efficient blast cleaning or peening. Your confidence in the material ordered should be based on actual use, rather than recommendation or reputation. Its true value to you can only be determined by a thorough test in your equipment, on your job.

To all outward appearances, most shot and grit may appear to be the same—but, that's where the similarity ends. Where Hi-Grade Shot and Grit are concerned, you'll find there IS a difference . . . a value far beyond purchase price that pays out in extra performance on *your* job. Hi-Grade Shot and Grit is *quality-controlled* from molten metal to finished product. Order a trial quantity today. Let results convince you *Hi-Grade is best by test.* That's the only practical and profitable way to buy abrasives.

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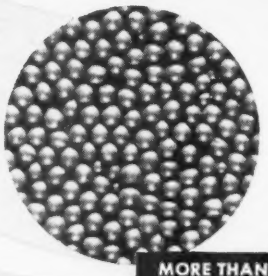
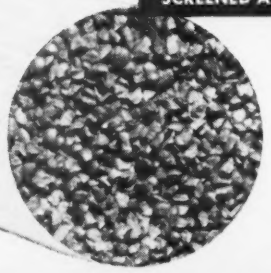
READY FOR IMMEDIATE SHIPMENT



HI-GRADE SHOT
UNIFORM SIZE AND HARDNESS

Withstands repeated strain, stress and wear. Famous for its lack of hollows, tails, irregular shapes. Exclusive alloying and tempering process helps prevent rust; minimizes impact fractures.

MORE THAN MEETS S.A.E. SPECIFICATIONS
SCREENED AND GRADED FOR 100% USAGE



HI-GRADE GRIT
SHARP, TOUGH AND DURABLE

Made of same material and processed by same methods as Hi-Grade Shot. Free from dust fines and scale. Cleans with maximum efficiency. Easy on equipment—reduces wear and maintenance costs.

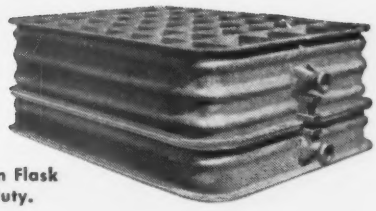
Clayton-Sherman *Abrasives Company*

MANUFACTURERS OF *QUALITY-CONTROLLED* SHOT AND GRIT

Representatives in Principal Cities

3896 LONYO ROAD ★ DETROIT 10, MICHIGAN

Model CH-20 Truscon Power Handled Flask.



Model CH-40 Truscon Flask for Extra Heavy Duty.

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THE SUCCESS of modern foundry methods depends upon the speed and economy with which molding operations can be handled.

Truscon's Pressed Steel Division—nationally known for the quality of its products and the dependability of its service—is fully equipped and prepared to handle your foundry flask requirements. The Pressed Steel Division's central location assures efficient service for your needs. Write for free catalog describing the complete line of Truscon Steel Foundry Flasks.

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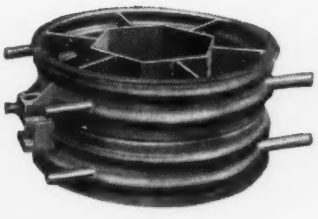
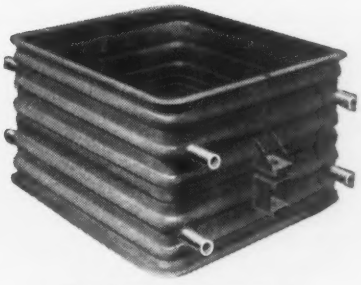
Subsidiary of Republic Steel Corporation

Model OM-1 Truscon Flask for One-Man Handling.

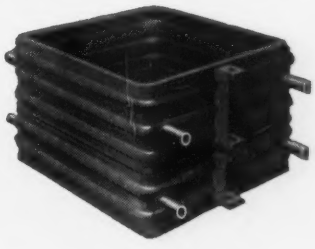
Model OM-4 Truscon Flask for One-Man Handling.



Model TMR-60 Round Truscon Steel Flask for Two-Man Handling.



Model TM-10 Truscon Flask for Two-Man Handling.



Model TM-12 Truscon Flask for Two-Man Handling.

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

New Foundry Alloy Neutralizes Effect Of Varying Section in Gray Cast Iron

Low-Carbon Foundry Ferrochrome is a new silicon-chromium alloy specially developed by ELECTROMET for the alloying of cast iron. It is so balanced in composition that it increases the strength and Brinell hardness of gray iron, as well as its resistance to wear and corrosion, without increasing the chilling tendency of the metal.

The alloy has a nominal analysis of 50 per cent chromium and 30 per cent silicon. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill depth. Light-section castings, such as automobile and truck exhaust manifolds and stove parts, may easily be produced in 1 per cent chromium iron by a simple ladle addition of the alloy to any base iron that would be suitable for casting the same parts in unalloyed iron.

Effect on Chill Depth

Fig. 1 illustrates how chill depth was affected by varying additions of the new alloy to a commercial cupola iron analyzing 3.24 per cent carbon and 2.12 per cent silicon, with 0.12 per cent residual chromium. A chill depth of approximately ¼ of an inch was obtained in all of these typical hatchet-type chill-test specimens.

Effect on Mechanical Properties

Although Low-Carbon Foundry Ferrochrome was especially developed for decreasing the section sensitivity of gray iron castings, it is also useful in obtaining moderate increases in the strength of gray iron, when used alone or in combination with the alloys nickel, molybdenum, or vanadium. An unalloyed base iron, analyzing 3.43 per cent carbon and 1.95 per cent silicon, was treated with additions of 0.36 per cent and 0.84 per cent chromium. The following table gives the complete analyses of the irons. It shows how both Brinell hardness and tensile strength were improved by the alloying additions.

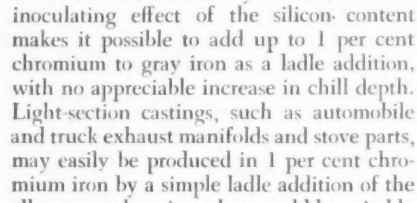


Fig. 1. These fractures of broken chill specimens show the effect on chill of chromium additions made with Low-Carbon Foundry Ferrochrome.

Analyses	Brinell Hardness	Tensile Strength
3.43 % total carbon, 1.95% Si, 0.05% Cr.....	202	31,000
3.41% total carbon, 2.20% Si, 0.36% Cr....	217	35,400
3.32% total carbon, 2.56% Si, 0.84% Cr.....	228	36,100

Auto Cylinder Castings

Addition of chromium to cast iron in the form of Low-Carbon Foundry Ferrochrome tends to stabilize the pearlitic structure of the iron, and to eliminate areas of soft secondary ferrite in slowly cooled sections. Moreover, the alloy helps avoid difficulties with chilled corners or edges in thin sections. It is therefore particularly well suited for producing a cylinder-type iron with consistently good structure and improved uniformity of hardness in sections exposed to widely varying cooling rates.

An example of the usefulness of this alloy is illustrated in Fig. 2, which shows strips cut from the bores of three automotive cylinder blocks. The base iron used in these castings was a typical unalloyed cylinder grade of cast iron, analyzing 3.38 per cent total carbon, 2.07 per cent silicon, and 0.08 per cent residual chromium.

The design of these castings was such that a heavy boss close to the cylinder bore caused slow cooling along one side, resulting in a soft area and wide variation in hardness along the length and around the perimeter of the unalloyed cylinder.

The strips illustrated in Fig. 2 were cut from the soft side of the cylinder bore. When subjected to a Rockwell B hardness exploration, casting No. 1 showed a variation in hardness from 92.2 to 80.2 Rockwell B (196 to 150 Brinell*). Casting No. 2 showed a variation from 94.0 to 90.8 Rockwell B (205 to 189 Brinell). Casting No. 3 showed a variation from 95.5 to 90.3 Rockwell B (213 to 187 Brinell).

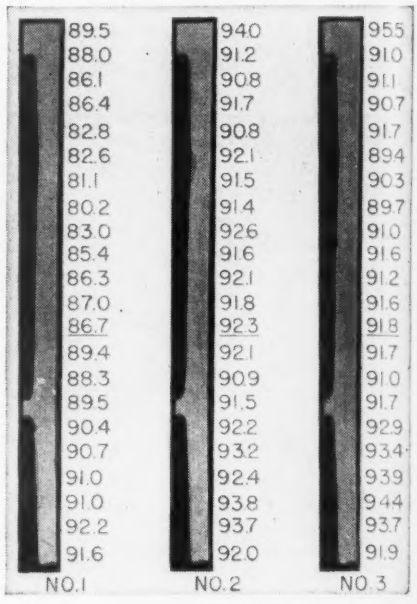


Fig. 2. Average Rockwell B hardness values at indicated positions in strip specimens from the bores of three cylinder block castings. No. 1-Untreated base iron containing 0.08% chromium. No. 2-Treated with 0.31% chromium added as Low-Carbon Foundry Ferrochrome. No. 3-Treated with 0.44% chromium added as Low-Carbon Foundry Ferrochrome.

The small chromium additions made in cylinders Nos. 2 and 3 had a marked effect in reducing the hardness spread and also in stabilizing the desired pearlitic structure in critical areas of the cylinder bore. This provided satisfactory resistance to wear in spite of difficulties introduced by an admittedly difficult design. Similar problems exist in most iron foundries—problems that Low-Carbon Foundry Ferrochrome can help solve with a minimum change in melting practice and at a very reasonable cost.

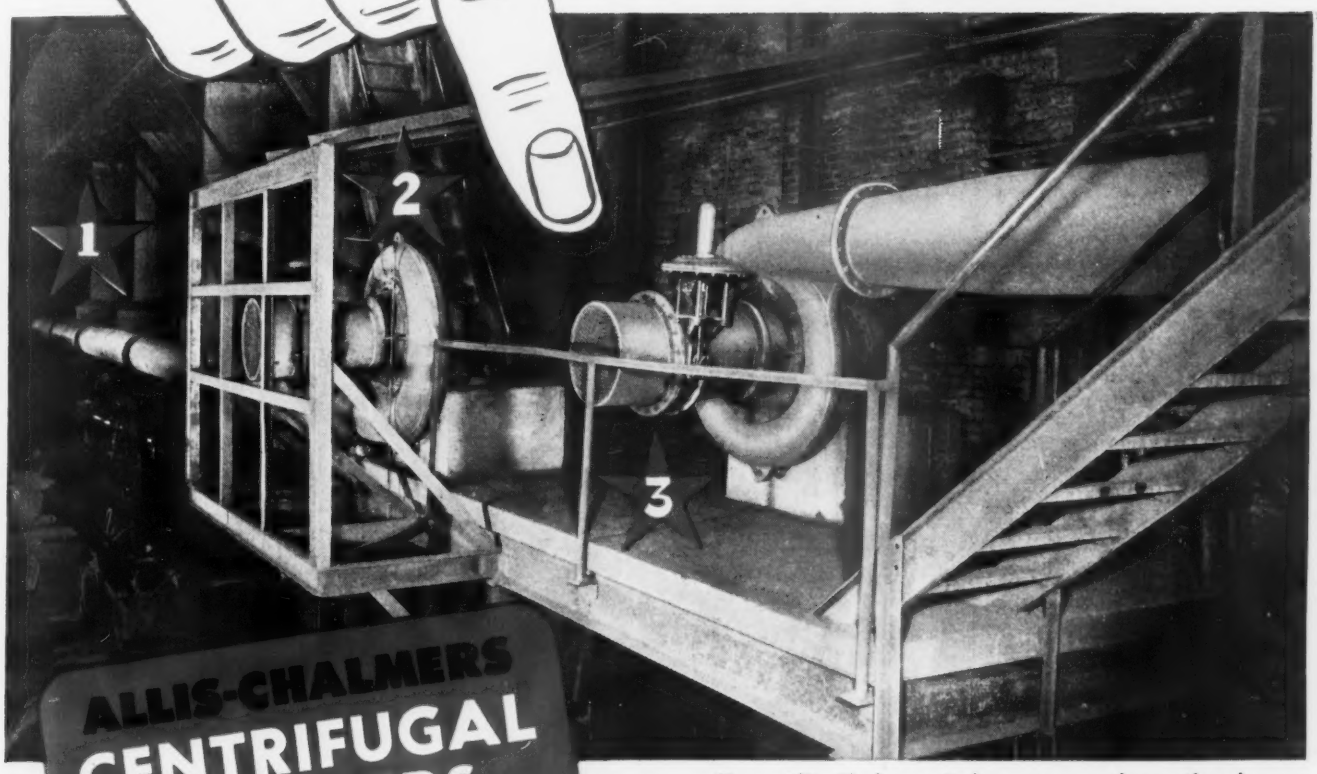
Booklets Available

Further information about this new ferrochrome is given in the booklets, "New Chromium Alloy Neutralizes Effect of Varying Cooling Rate in Gray Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

*All Brinell hardness values were obtained by conversion from Rockwell B.

The term "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation.

3 Blowers SERVICE 6 CUPOLAS!



ALLIS-CHALMERS CENTRIFUGAL BLOWERS

Three Allis-Chalmers 60-hp motors and centrifugal blowers perform double duty by supplying the air needed by *six* cupolas at this large foundry. Blowers each rated 5750 cfm, 1.75 G, 3550 rpm.

SIX CUPOLAS ARE KEPT ON THE JOB by *three* Allis-Chalmers centrifugal blowers in the foundry of this large midwestern machinery manufacturer.

These three Allis-Chalmers blowers (one at end of pipe out of camera range at left) supply three cupolas at a time . . . alternate ones are shut down for lining maintenance between melts. For *six years* these blowers have kept this up, switching from one cupola to another, and with only routine maintenance, *no repairs!*

Both reliability and precision output are vital here. All foundry operations rely on the four grey iron and two malleable iron cupolas. Cupola operation is especially critical where malleable iron is concerned, since the component elements demand precise control.

The constant air weight control on the blower inlets automatically delivers a metered amount of air to insure uniform melts. There is no necessity of blowing off to atmosphere and wasting power, as with positive pressure blowers.

The cast iron casing reduces vibration, lowers noise level, and gives long life impossible with fabricated construction. With the impeller "overhung" on the motor shaft and supported by anti-friction bearings, the installation is compact and readily accessible.

For the full story call your nearest A-C sales office or write to Allis-Chalmers, Milwaukee, 1, Wisconsin for Bulletin 16B6048B. A-3548

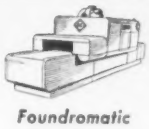
Foundromatic and Regulex are Allis-Chalmers trademarks.

ALLIS-CHALMERS A-C ALLIS-CHALMERS

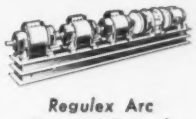
Foundry Equipment for Bigger Output-Better Working Conditions!

Foundromatic Shakeouts

Motors-Drives-Control


Foundromatic Core Dryer

Induction Heating & Melting


Regulex Arc Furnace Control

Towmotor Certified Job Studies show how other companies in *your* industry, with problems just like *your* problems, have cut production costs, increased output per man-hour, handled more tonnage . . . SAVED MONEY IN EVERY WAY . . . with Towmotor Mass Handling. Packed with helpful information, and illustrated with on-the-job photos, Towmotor Certified Job Studies clearly picture BIG SAVINGS on those jobs with which YOU are most familiar.

Look at these typical TOWMOTOR SAVINGS

- *Car unloading costs cut as much as 70% in many plants*
- *A big appliance manufacturer cut handling costs 65%*
- *75% of floor area saved with high stacking*
- *Breakage eliminated in a bottled goods plant*
- *Carloads of steel unloaded in 1¼ hours—saving 87%*
- *A retail warehouse saves $635 weekly*
- *A canned goods warehouse cut car loading costs 75%*
- *An auto parts maker saves 160 man-hours weekly*
- *Storage capacity doubled in many warehouses*

See how YOU can reduce costs in all phases of Receiving, Processing, Storage and Distribution. Write today for Job Studies covering your industry.

TOWMOTOR CORPORATION, DIV. 72
1226 E. 152ND STREET, CLEVELAND 10, OHIO
Representatives in all principal cities in U. S. and Canada

TOWMOTOR
THE ONE-MAN-GANG®

FORK LIFT TRUCKS and TRACTORS
RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

*HOW MANY PEOPLE HAVE YOU TALKED TO ABOUT **AMERICANISM** TODAY?*

Here's the Answer...

for easy release of shell molds, use

DOW CORNING 7 EMULSION!

FIRST IN SILICONES
DOW CORNING 7 EMULSION
SILICONE RELEASE AGENT FOR RESIN BONDED SAND SHELL MOLDS
NET WT. • LOT NO.
DOW CORNING CORPORATION, MIDLAND, MICHIGAN USA

This NEW Silicone Release Agent:

- gives easy release of clean, sharply defined resin-bonded sand shell molds:
- reduces build-up on patterns; cuts pattern cleaning costs; maintains close tolerances.
- It's noncorrosive and nonflammable.
- Easily applied by spraying or dipping, this water dilutable emulsion of Dow Corning 7 Compound is equally effective with various metals; one application will release several shells.

Send Today For Free Sample

WRITE DEPT. AH-13

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

FIRST IN SILICONES

DOW CORNING CORPORATION

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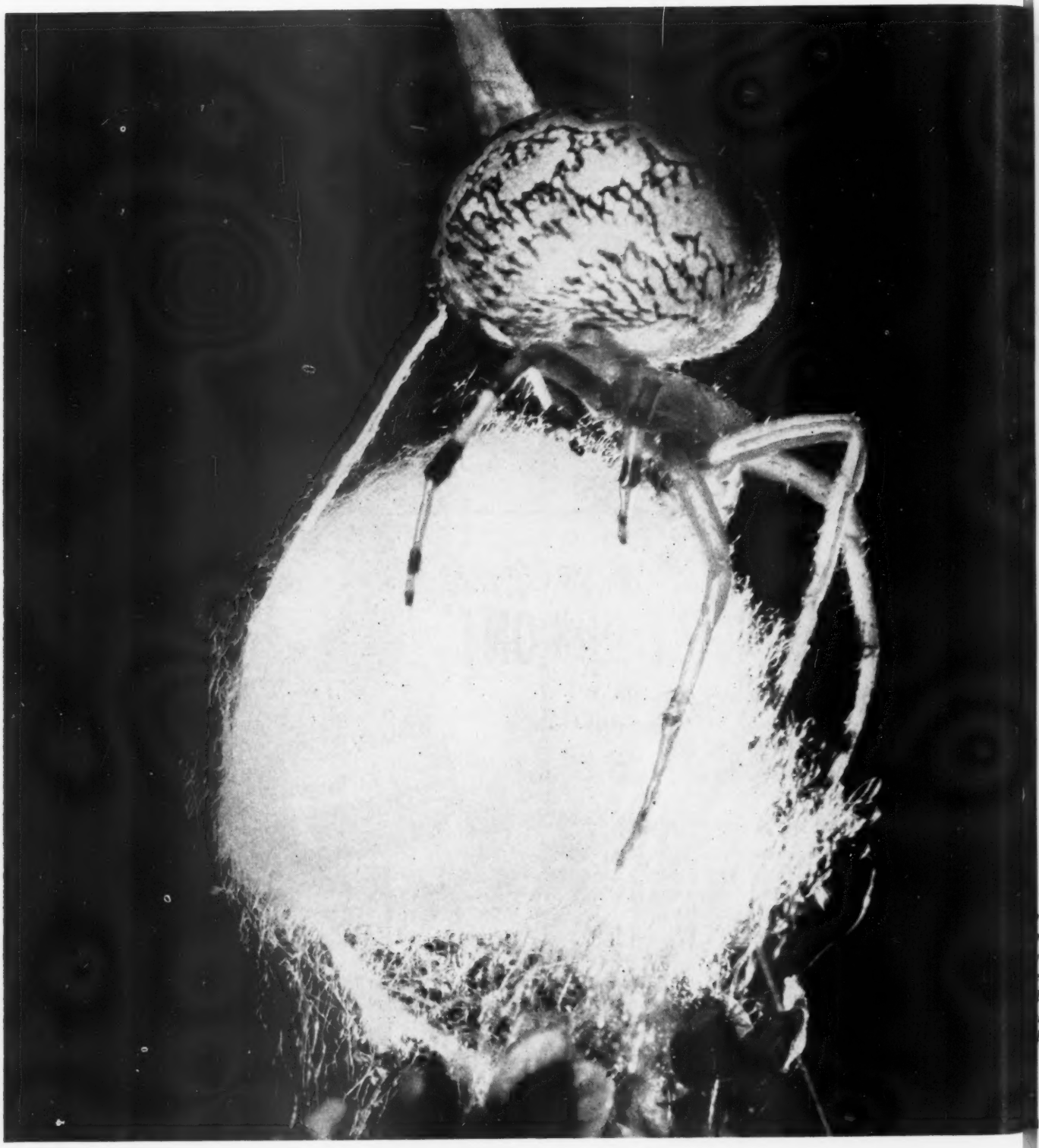
CRAFTS



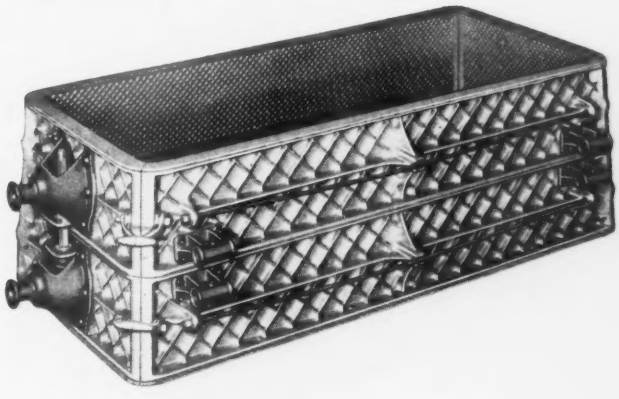
TSMANSHIP

The Aranea, or Spider, is considered one of the most distinguished craftsmen in the animal kingdom. Its carefully-spun, silken webs and egg-cases are masterpieces of engineering and construction.

In their own field, HINES FLASKS, too, are masterpieces—products of similarly distinguished craftsmanship. For over thirty years, HINES has specialized in the production of foundry flasks and jackets, and has achieved the reputation for making the finest in the market. So, when you want the best, forget the rest—specify HINES!

HINES FLASKS

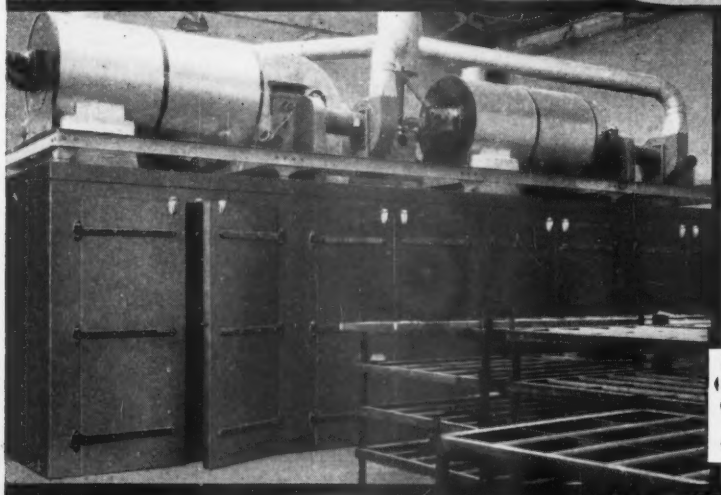
HINES POP-OFF FLASK



oto-enlargement at left shows a female spider nstructing her egg-case or cocoon. Layer upon er of pure white silk is loosely woven about hundreds of golden eggs. Later, the cocoon ll be covered with a tough, parchment-like ing within which the newly-hatched young ll be well-protected from the rigors of winter.

e Hines Flask Co., 3431 West 140th Street, Cleveland 11, Ohio • Telephone: ORchard 1-2806

Two Compartment Car Type Mold Drying Oven.
Two Compartment Rack Type Core Oven.
Single Compartment Rack Type Core Oven.
LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO



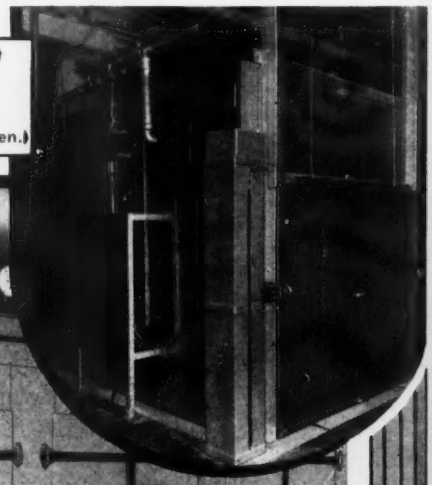
The Lanly reputation has been established as the result of the consistent incorporation of advanced, efficient design and high grade construction into every Lanly installation.

Core baking, pasting and mold drying ovens as well as casting conditioning and heat-treating ovens are available in standard units.

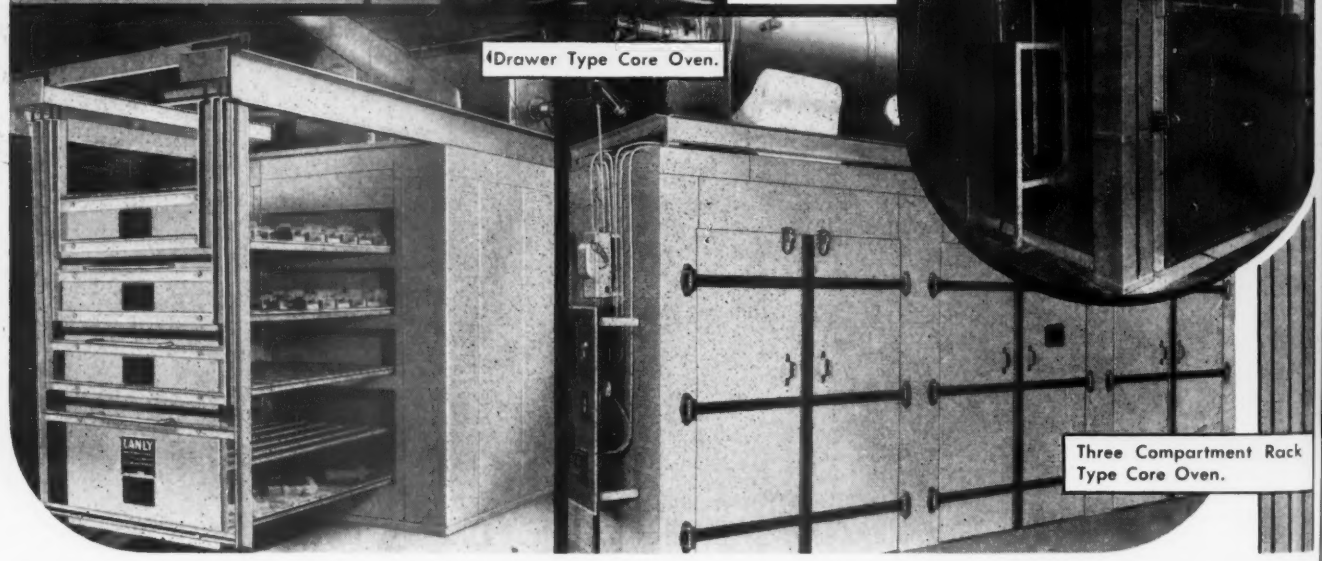
Write for Literature and Complete Information.

Four Compartment Rack Type Core Oven.

Car Type Core Oven.



Drawer Type Core Oven.



Three Compartment Rack Type Core Oven.

How To Get Easier Parting, Smoother Castings, Less Smoke

Use **"dag"** colloidal graphite dispersions to coat chills, molds, patterns, cores, push pins, shoulder screws, flask pins . . . even to coat ladle interiors.

An application of colloidal graphite will produce an unusually slippery dry film because of its peculiar arrangement of atoms. It is virtually unaffected by heat . . . . up to 5000° F. in inert atmospheres . . . and is so thin that critical casting tolerances are not affected at all.

Patterns, dies, and molds treated with **"dag"** colloidal graphite give superior reproduction and smoother casting surfaces. Less finishing is required; rejects are fewer; mold life is lengthened.

"Dag" water dispersions also eliminate or reduce the choking fumes and smoke usually caused by conventional petroleum-base parting compounds, thus improving shop conditions.

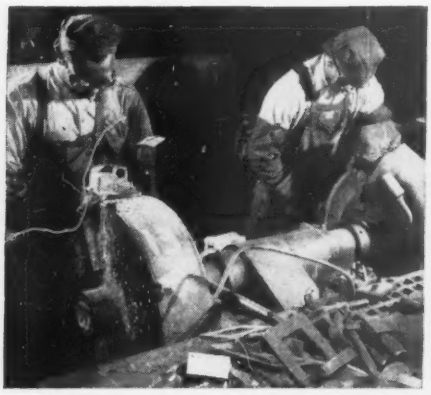
The new and complete bulletin "Use of Colloidal Graphite in the Foundry" is yours for the asking. Write today for Bulletin # 425-14A.

dag DISPERSIONS®

Acheson Colloids Corporation, Port Huron, Michigan

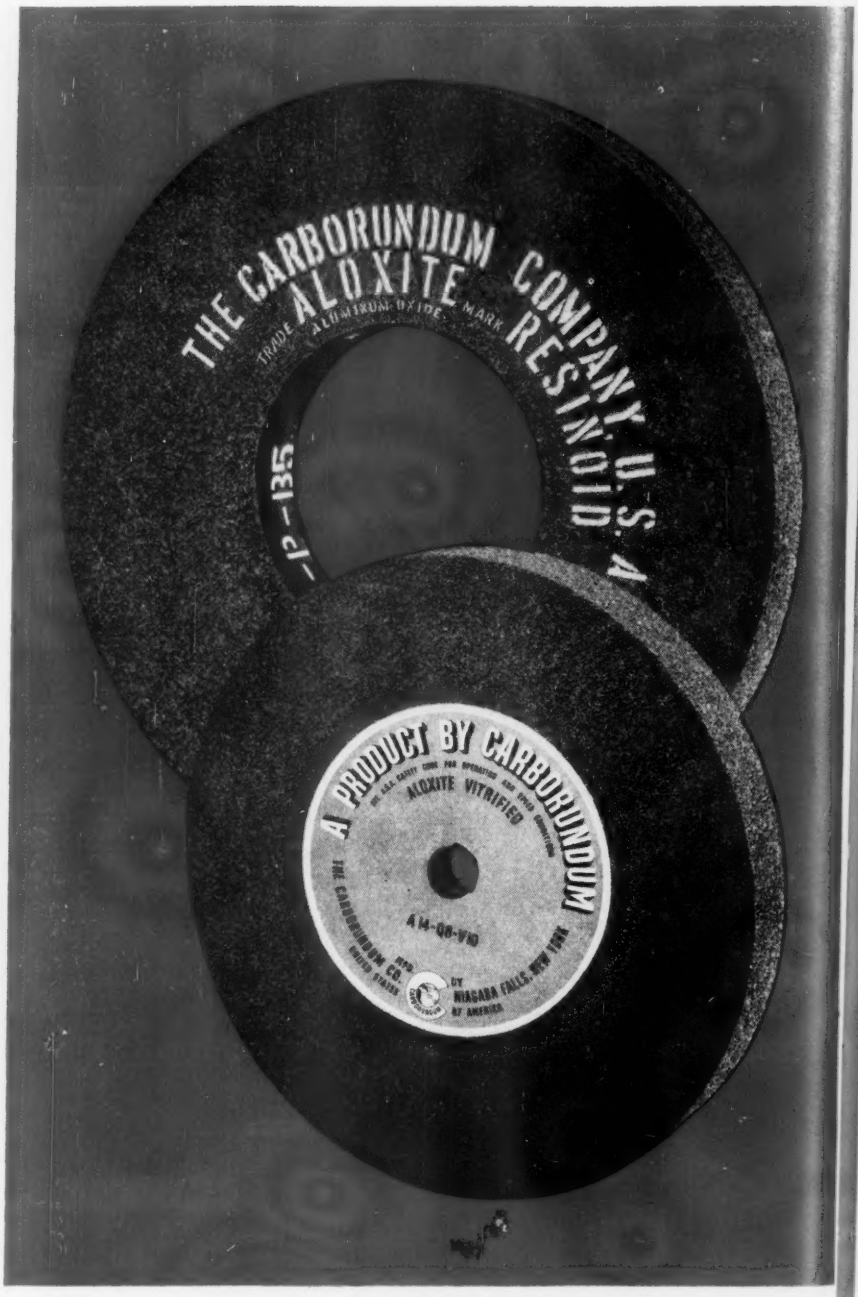
. . . also Acheson Colloids Limited, London, England

It takes the RIGHT



OUR NEW and improved V10 Bond Wheel is especially designed for use on low-speed equipment for grinding high tensile strength materials. It is a revolutionary modification of an existing product.

TYPICAL OF NEW developments at CARBORUNDUM are improved B5 and B7N resinoid bond aluminum oxide and silicon carbide wheels for high-speed operations. They provide higher productivity with added safety and lessen operator fatigue.



Only **CARBO**

TRADE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York

Abrasive to do the job RIGHT

With production schedules stepped-up and costs on the rise, using the *right* abrasive becomes even more important in boosting output while effecting substantial savings.

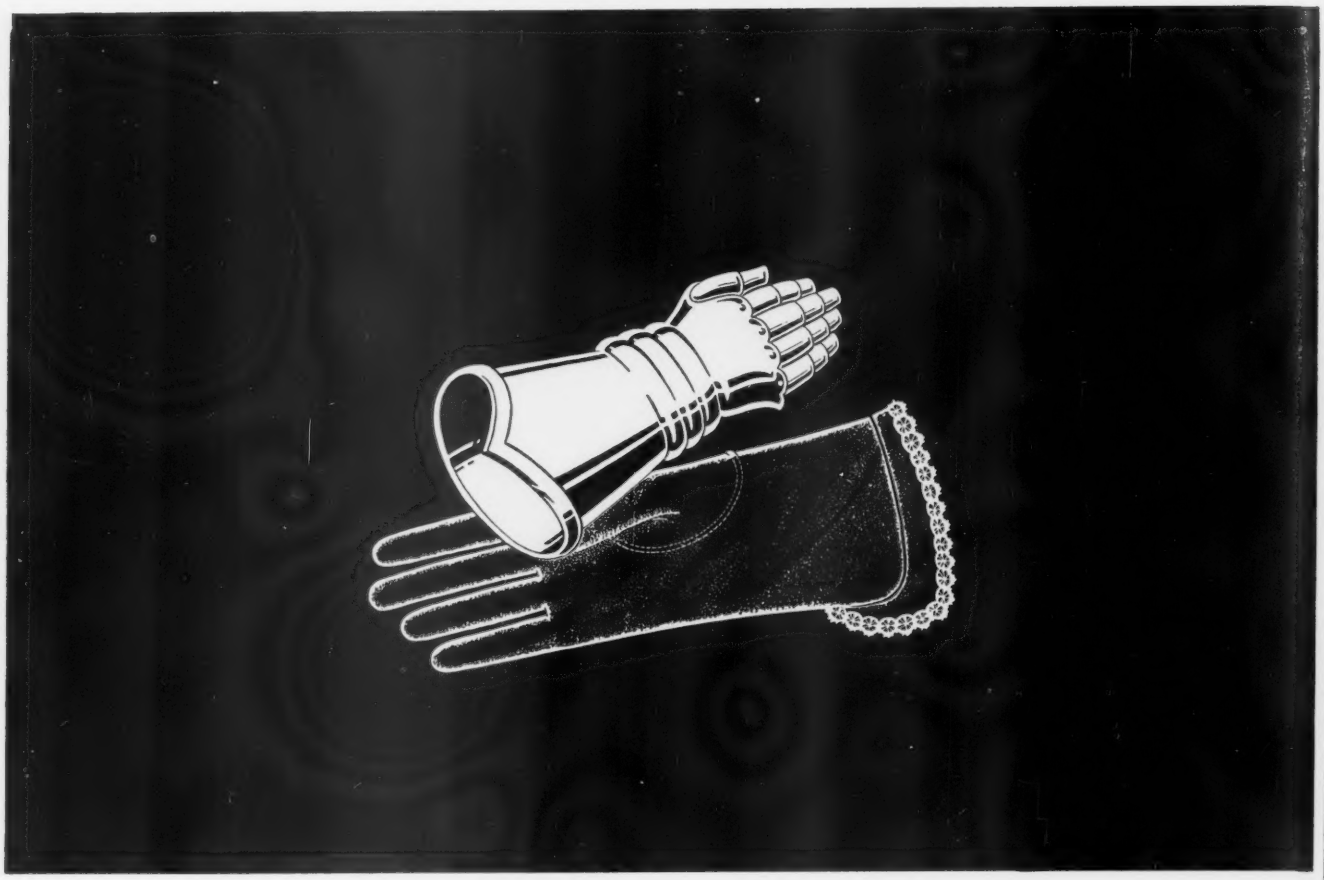
CARBORUNDUM's complete line of bonded abrasives includes the right product for every job. It covers the full range of high and low speed wheels, disc wheels, mounted points, rubs and other special abrasives. To meet changing job requirements, continual improvements and developments are made in both products and their application. That's why, when you call in CARBORUNDUM, you are assured of the *right* abrasive for the job... the most efficient... the most economical... impartially recommended.

ANOTHER recent development is the new VD Bond series of silicon carbide vitrified wheels... establishing new records in grinding gray iron, hard malleables, semi-steel and non-ferrous metals.

RUNDUM

MARK

makes ALL Abrasive Products... to give you the proper ONE



THE IRON FIST IN A *Velvet Glove*

Supposing—just supposing—YOU could write the specifications for an ideal blastcleaning chilled shot and grit. What qualities would you specify? You'd want it to be hard, of course, so it would clean fast. But you wouldn't want it so hard as to wear out your equipment at a rapid rate. Neither would you want the shot to be hard AND BRITTLE.

The ideal chilled iron shot and grit would be hard enough to do a fast cleaning job. And, if possible, you would want the hard iron carbides (that do the cutting) imbedded in some soft material that would go easy on your equipment and keep the shot from shattering into small ineffectual fines. What you would want is a sort of an "iron fist in a velvet glove" kind of shot and grit.

It may come as a surprise to you that there *is* such a shot and grit made. A chilled iron shot that holds the iron carbides in a *ductile matrix*—a shot that is hard enough to clean fast, yet soft enough to spare equipment and keep the shot from shattering too quickly. It is National Controlled "T" Shot and Grit.

We're not going to make any wild claims—we know YOU can appreciate the advantages of such shot and grit—providing what we say is true. And we'd like to prove our case *in a matter of minutes*—if you'll let us. Please write your name and address on the lines below and mail the coupon to the nearest Hickman-Williams office. The most you can lose is the cost of postage, but you may profit to the tune of a substantial sum of dollars.

NATIONAL CONTROLLED "T" SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*
NATIONAL METAL ABRASIVE COMPANY • CLEVELAND, OHIO
WESTERN METAL ABRASIVES COMPANY • CHICAGO HEIGHTS, ILL.
AND SOLD EXCLUSIVELY BY

HICKMAN, WILLIAMS & COMPANY
(INCORPORATED)

CHICAGO • DETROIT
CINCINNATI • ST. LOUIS
NEW YORK • CLEVELAND
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INDIANAPOLIS

OK. Let's see you prove your point . . .

Name_____

Firm_____

Address_____

City_____

MAIL TO HICKMAN, WILLIAMS OFFICE NEAREST YOU

TRAMRAIL COVERAGE *SPEEDS* FOUNDRY PRODUCTION

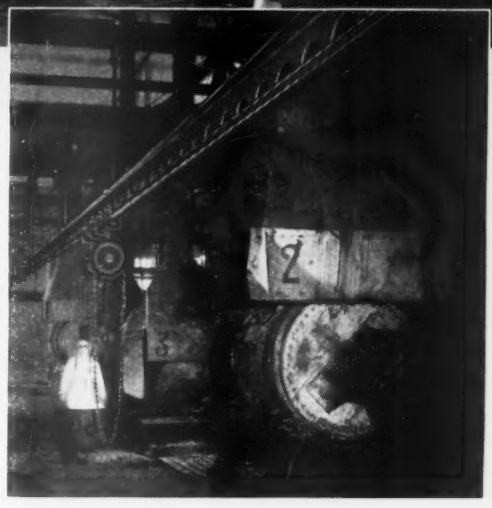
Jobbing Foundry Cuts Costs with Hand-Propelled System

Metal is quickly transferred to the hand-pouring ladles. This Cleveland Tramrail system is completely hand-propelled. Gray iron, aluminum, magnesium, brass, bronze, and monel castings are produced in this jobbing foundry.

When one considers that as much as 250 tons of materials must be moved to produce one ton of finished castings, depending on casting size, the importance of easing and speeding foundry handling is self-evident. Saving just one minute on every ton handled will reduce production time by over four hours.

Cleveland Tramrail equipment enables such tremendous time savings that frequently the output of a plant is increased by 25% to 100% without adding an additional foot of floor area.

Why not give Cleveland Tramrail a trial in your foundry? A representative will be glad to give you the details.



Bull ladles with hot metal from these electric furnaces are easily conveyed on the overhead Tramrail directly to the pouring floor.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3831 East 286th St. Wickliffe, Ohio.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

mechanize your manpower

Take the shovel out of a man's hand and put him on the seat of a PAYLOADER. He'll show you how to lick rising costs, how to increase output and solve manpower shortages. Hundreds of foundries and metal working plants have taken this step with highly gratifying results. And PAYLOADERS can do so many jobs that there is hardly any limit to their usefulness.

Every PAYLOADER is a complete Hough-built tractor-shovel specifically designed with multiple reverse speeds and other features that insure fast, low-cost bulk material handling. There are several sizes from the 12 cu. ft. Model HA shown, up to 1½ cu. yd. bucket capacity. They are also available in front-wheel, rear-wheel and four-wheel-drive models.

Every PAYLOADER is backed by 30 years of material handling equipment manufacture and a Hough Distributor with complete parts and service facilities. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

On These Jobs

- Unload box cars.
- Carry sand, coke, scrap, limestone, etc., to storage.
- Transport and distribute sand to molding stations.
- Remove used sand from floors.
- Windrow sand for the cutter.
- Charge mullers, hoppers, tumbling barrels.
- Feed conveyors, elevators, mixers, screenerators.
- Clean up gangways, aisles and other areas.
- Handle coal, ashes, cinders.
- Handle scrap and small castings.
- Maintain private roadways.
- Do cranework — haul, push.
- Remove snow.

HELP for your material handling problems is found in "Industrial Handling" the free Hough magazine. Catalog on any size PAYLOADER is available, without obligation.

PAYLOADER®

THE FRANK G. HOUGH CO. · *Since 1920*

50,000-lb. Butterfly Valve

CAST IN TRULINE®-BONDED CORE

This giant casting provides further proof that Hercules Truline Binder is used wherever metal is cast. The core in this case was baked to perfection overnight with the addition of just slightly more than 1% of Truline by weight of the total mix.

Truline Binder helps cut costs and saves time because it:—

1. Replaces core oils and pitch to advantage.
2. Is unexcelled when used with reclaimed sand and crude sand.
3. Cuts baking time.
4. Saves time in the cleaning room.
5. Is readily available.
6. Costs less than many other binders and is more efficient.

If you want your castings to come out sounder . . . truer . . . cleaner . . . write to Hercules for technical data and a generous testing sample of Truline Binder.

NF51-6

CORE MIX USED ABOVE

2,000 lbs. Sand 53 A.F.A.

400 lbs. Silica Flour

100 lbs. Fire Clay

50 lbs. Bentonite

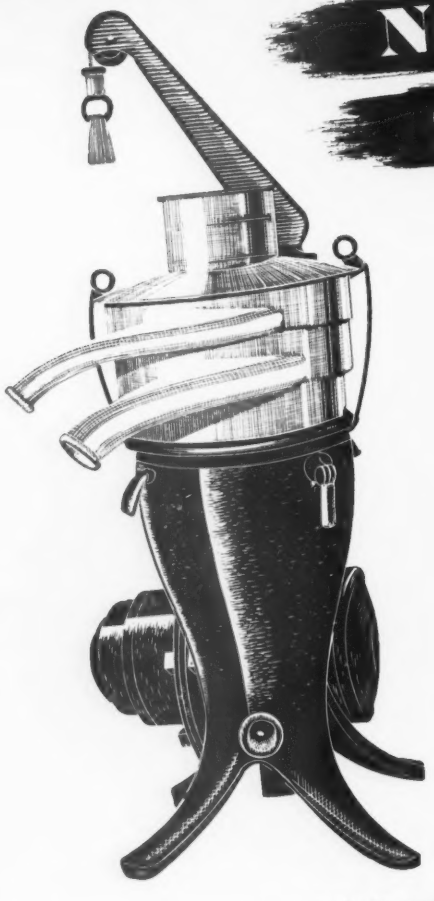
30 lbs. Truline

7-8% Moisture

HERCULES POWDER COMPANY INCORPORATED Naval Stores Dept., 920 King St., Wilmington, Del.

DAIRY PLANT OPERATORS DEMAND....

Nickel Silver Castings for Appearance, Economy, Resistance to Corrosion



Pump casings, impellers, fittings and numerous parts for milk separators and sanitary pumps are cast in Nickel Silver. Users of Nickel Silver for these parts make this wise selection because they know that sanitation . . economy . . corrosion resistance and appearance are combined in this material.

Many state food codes include Nickel Silver alloy requirements in those phases of food processing where these qualities are required . . for experience has proved that Nickel Silver castings reign supreme.

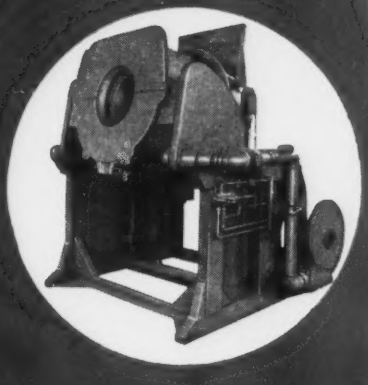
Specify—LAVIN NON-FERROUS INGOT—*Quality*

R. LAVIN & SONS, INC.

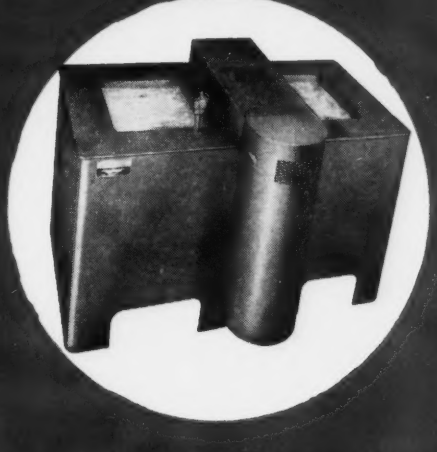
Refiners of Brass, Bronze and Aluminum

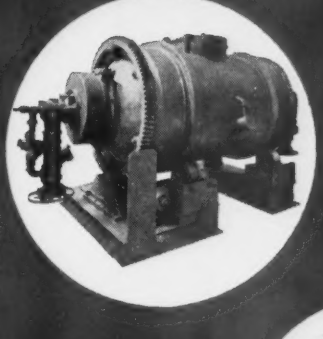
3426 SOUTH KEDZIE AVENUE · CHICAGO 23, ILLINOIS

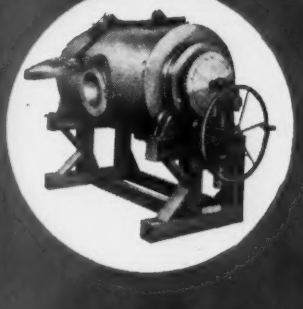
REPRESENTATIVES IN PRINCIPAL CITIES

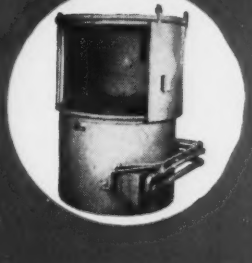


MELTING AND HOLDING FURNACES









Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.

Bulletin 331 covers the complete melting line. Write for your copy today.

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2453 WEST HUBBARD STREET · CHICAGO 12, ILLINOIS

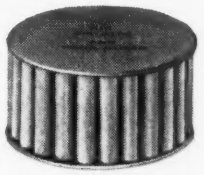
RESPIRATORY PROTECTION

*WITH **R31** CARTRIDGE — For low concentration of light organic vapors and gases in paint spraying, degreasing, dry cleaning, cementing, etc. Absorbs vapors of benzene, xylene, toluene, gasoline, naphtha, acetone, turpentine, etc.

*WITH **R32** CARTRIDGE — For low concentrations of acid gases, mists — sulphuric acid, hydrogen chloride, etc. Used in plating, pickling operations and similar.

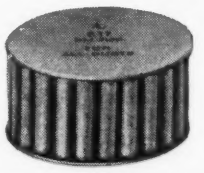
*WITH **R15** CARTRIDGE — For nuisance and pneumoconiosis-producing dusts. (BM-2121)

*WITH **R33** CARTRIDGE — For low concentrations of combined acid and organic gases such as halogenated hydrocarbons, carbon tetrachloride, acetic acid. Protects in degreasing operations, etc.



*WITH **R16** CARTRIDGE — For toxic dusts not significantly more harmful than lead. (BM-2138)

*WITH **R34** CARTRIDGE—Protects against nuisance concentrations of ammonia.



*WITH **R17** CARTRIDGE—For all dusts not significantly more toxic than lead. (BM-2138)

1 FACE PIECE— 7 CARTRIDGES

(Quickly Interchangeable)

Protect against Dusts, Gases and Vapors

WITH THE AO R2000 RESPIRATOR

When a variety of hazardous vapors, gases or dusts are a problem, you can now simplify the protection and save money by standardizing on the AO R2000 Respirator. Its single, basic face piece accommodates four chemical cartridges of NON-SPARKING metal and three dust cartridges which, while light in weight for comfort, have maximum filtering capacity. CARTRIDGES INTERCHANGE WITH A TWIST OF THE WRIST—one twist removes outer cover, a second replaces it. Respirator may also be used with highly efficient, chemically-treated disposable dust filter.

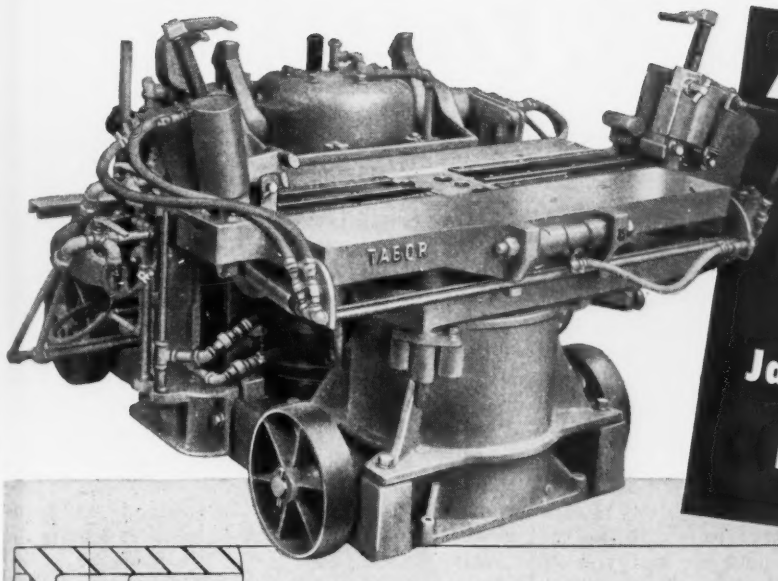
QUICK RESPIRATOR FACTS

- Face mask molded from pliable rubber.
- ½" rubber headband.
- Inhalation valve of pure gum rubber freely admits air at lightest intake of breath, seals tightly on exhalation.
- Exhalation valve cannot stick, completely expels air—moisture cannot collect, dust cannot enter.
- Disassembly for cleaning is easy without special tools.

Your nearest AO Safety Products Representative can supply you

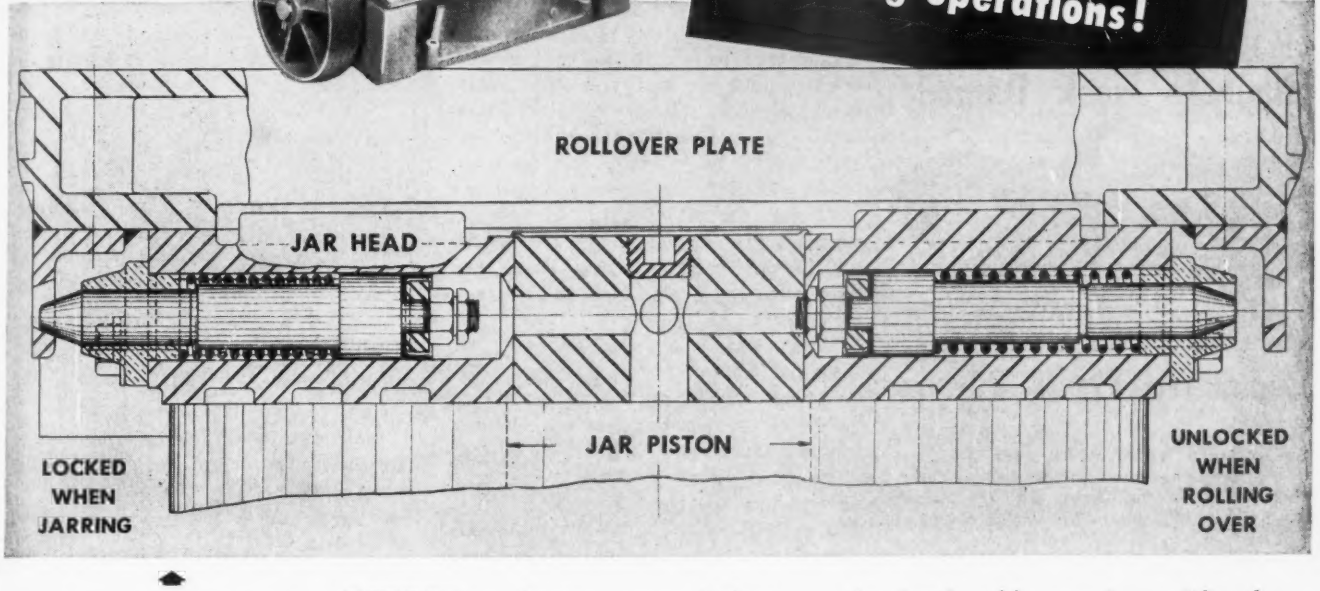
American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



ANOTHER TABOR FIRST...

Rollover Plate and Jar Head locked during jarring operations!



ROLLOVER PLATE—JAR HEAD LOCKING DESIGN
The above sectional drawing illustrates Tabor's new locking arrangement. Jarring air pressure automatically throws rugged pins into seats under the rollover plate. Pins retract under spring tension when jarring valve is closed.

Rollover Plate, Jar Head and Jar Piston are made from *steel castings or forgings*

HERE'S a feature never before offered in jar, power rollover, power draw machines. New Tabor construction locks rollover plate and jarring mechanism *into one rigid assembly* the moment jarring air is introduced.

This gives you *four* distinct advantages:

(1) Effectiveness of jarring blow is increased 25%.

(2) Ramming effect is equalized *all over the mold.*

(3) Does away with unwanted "secondary jolt" between plate and jar head—adds greatly to life of both members.

(4) Eliminates all plate wobble, even when handling a mold with uneven weight distribution.

Always big producers, Tabor Rollovers also feature the new quick-change-over table which permits *independent* setting of all four clamps—a table design which is invaluable in either core room or jobbing shop where pattern changes are frequent.

Get full details. Write, wire, or phone today.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR *Manufacturing Co.*

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6223 TACONY STREET • PHILADELPHIA 35, PENNA.

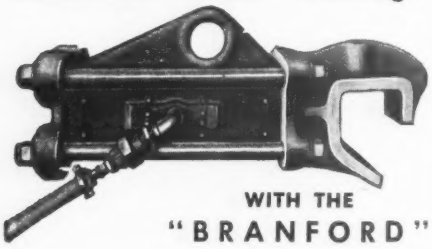
"BRANFORD" Vibrators

Match Plate Vibrators

Trouble-free service is assured by uniformly hardened heads, tough steel body and hard chrome-plated piston. Made and in three

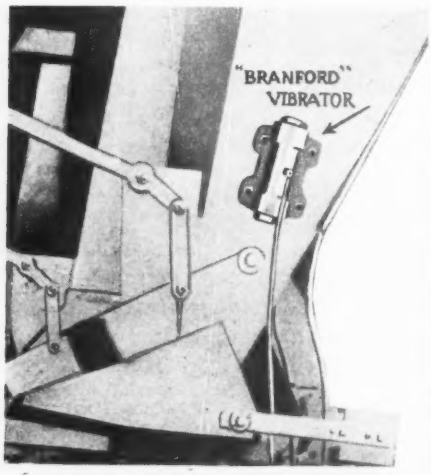
styles and 13 different sizes in both spring and angle springless types. The fast positive action of the "BRANFORD" assures quick draw.

Clean Flasks Faster . . . Eliminate Flask Damage



WITH THE "BRANFORD" Pneumatic Flask Rapper

Powerful, dependable units—quickly and easily moved about. Day after day they deliver unfailing service under toughest conditions. Made in seven sizes to handle flasks from 20" square up to 20' by 24' x 4' deep—green or dry sand. Jaw takes wide variation of flask flanges.



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Reader's COMMENT

Nodular Iron Fracture Odor

TO THE EDITORS:

With reference to B. F. Brown's article on "The Characteristic Odor of Nodular Iron Fractures and Carbide Slags", which appeared in the October, 1951 issue of FOUNDRY, I shall put forward another hypothesis in this conncetion, based on my personal experience.

Magnesium, when alloyed with silicon and exposed to moisture, generates the same odor as that developed by nodular cast iron. The magnesium-silicon phase diagram has been determined particularly by Vogel[1], and by Woehler and Schliephake[2]. In this diagram (shown below) we can see that the Mg forms with Si only one compound, the Mg_2Si (36.59 per cent Si), and that this compound is present, free or in eutectic form, in all the Mg-Si alloys.

This compound reacts easily to moisture, forming silane gas:

$$Mg_2Si + 2\ H_2O \rightarrow 2\ MgO + SiH_4$$

We can recognize this magnesium silicide, face-centered cubic, in all Mg nodulizing alloys containing Si, and also when treating gray iron with Mg or Mg alloys not containing Si. The Si contained originally in iron and the Si added as inoculating agent will partially react with Mg, thus originating Mg_2Si, which remains in the iron as a dispersed phase.

Therefore, I believe that the silane originated from Mg_2Si hydrolysis is primarily responsible for the characteristic nodular cast iron odor, not excluding other gases, as those discussed in the mentioned article. We will also note that both the nodular iron odor and the Mg_2Si odor are slightly different from acetylene and phosphine odor.

The fractures of ordinary irons do not smell of silane even with high silicon content, because practically the only silicides that react in this way are magnesium silicide, evidently absent in these irons, and calcium silicide, which we can exclude owing to very restricted solubility of Ca in iron.

SERGIO ALLARIA

Corsio Bramante 89
Turin (314) *Italy*

1. R. Vogel, *Zeitschrift fuer Anorganischen Chemie*, 61 (1909), pp 46-53.
2. L. Woehler, O. Schliephake, *Zeitschrift fuer Anorganischen Chemie*, 151 (1926), pp 11-20.

* * *

Foundry Engineering Courses

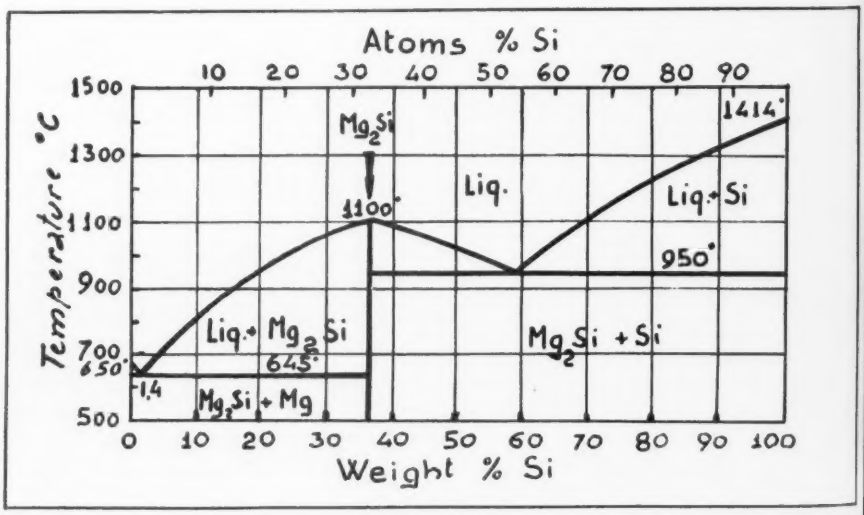
TO THE EDITORS:

Can you supply or tell me where I may obtain a list of colleges or universities offering courses in foundry engineering?

A. SKLAR

Bridgeton, N. J.

Editors' Note: In the August issue of FOUNDRY an article "The FEF—Its Accomplishments and Future Opportunities," by George K. Dreher listed the 14 engineering colleges associated with the Foundry Educational Foundation in providing courses specifically teaching cast metals technology. For further information on these and other colleges offering such courses we suggest that you communicate with Mr. Dreher, Foundry Educational Foundation, Terminal Tower, Cleveland 13.



Magnesium-silicon phase diagram by Vogel

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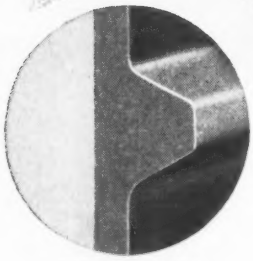

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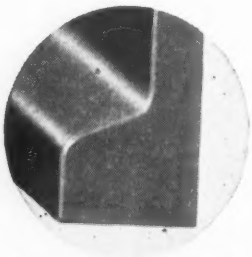

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Needs Full Industry Support

BACK in the middle thirties, when the foundry industry was confronted with the silicosis racket, the American Foundrymen's Society organized a Safety and Hygiene Section, with E. O. Jones as director. A Safety and Hygiene Committee was formed with James R. Allan, International Harvester Co., Chicago, chairman, and with the personnel drawn from the leading authorities in the field.

Over a period of years this activity of the society rendered important service to everyone connected with the production of castings by providing a sane and fair approach to the problems of industrial health. One of the valuable contributions of the committee was the development of so-called "codes" of recommended practice based on the available engineering knowledge and experience. These recommendations were given wide distribution among foundries throughout the world, and still remain the only published recommended practices on the subject. There can be no doubt that the work of that section of the society saved the industry a substantial sum of money, and at the same time pointed the way toward greatly improved working conditions.

While the committee was disbanded during the war, problems arising in the early postwar period indicated the need for a strong safety and hygiene program which would also include work in air pollution and perhaps water pollution. Recognizing the need, but lacking finances for such an undertaking, the Board of Directors of AFS referred the problem to the newly formed National Castings Council.

After discussing the subject at a number of meetings, the Council agreed on the importance to the foundry industry of further work in safety and hygiene. It expressed the opinion that AFS was best equipped to handle such a program for the entire industry and on Jan. 20, 1949 suggested to AFS that it undertake such a project, including the raising of funds.

During the past two years, AFS has completed organization of the Safety & Hygiene and Air Pollution program, which will call for an estimated expenditure of $350,000 over a minimum period of 10 years. Recently NCC approved the project as established and recommended that all individual companies of the foundry and allied industries provide financial support. The AFS campaign for funds now is under way.

The Safety & Hygiene and Air Pollution program of AFS offers the only economical way for the foundry industry to meet pressing problems with adequate engineering data. For the future welfare of this industry, the project should have the financial support of every organization connected with the production of castings.

Frank G. Steinebach
Editor

Casting 100,000

COMPACT, efficient design for mass production of specialized, high-quality, corrosion, heat and wear-resistant castings in white and gray alloyed irons features the electric furnace foundry operated by Engineering Castings Inc., Marshall, Mich. Organized a little over five years ago, the company began operation in a 24 x 22 ft area, quickly enlarged to 24 x 40 ft, rented from the city of Marshall. Production of the company's specialty—alloy iron valve seat inserts—soon reached 15,000 a day with ten men handling the complete operation. Green sand molding was done on one squeeze machine, melting accomplished with two 100-lb rocking electric arc furnaces.

Four years ago the company bought the building and property it now occupies. The property consists of an area approximately 240 x 700 ft.; the original building, 40 x 80 ft., has been enlaged twice to its present size of 60 x 130 ft and several additional service buildings constructed. Production capacity is now 100,000 valve seat insert and similar small castings per day. The inserts are circular rings varying from about 1 to 4 in. OD and are cast in green sand to tolerance of plus or minus 0.010-in. Surface finish is good and castings break away cleanly from the small, flat gates with little or no stub to be ground off. A. E. Rhoads, president and general manager of Engineering Castings, is proud of the fact that the quality of valve seat castings produced by the company has helped raise the standard of such work in the industry and has been instrumental in bringing back to foundries this type of work which had in a number of cases slipped away to forging shops. The castings are made to closer tolerances than by previous methods—they are more concentric, with less required finishing stock and resulting in greatly reduced rejects or finishing department scrap.

The company has been operating two nine-hour production shifts and a six-hour skeletonized cleanup shift six days a week. Purpose of the six-hour shift

Fig. 1—Squeezer machine at left produces pouring basins; the other two make stack mold sections

Fig. 2—Corner of the south foundry, showing the jolt squeezer machine used on snap flask wo

By ROBERT H. HERRMANN
Associate Editor
FOUNDRY

Valve Seat Inserts Daily

is to break up remelt, clean remelt and castings in the shot blast machine and clean up the foundry generally, getting the shop in readiness for the first production shift of the day.

While valve seat inserts for automobile, bus and truck, marine and aircraft engines have been the company's principal product, the output is not confined to this class of work. Other regular production items made of high quality alloyed irons to meet exacting service requirements include automotive transmission pump rotors, high-speed high-pressure hydraulic pump parts, wear rings and trowels for concrete tile machinery, diesel and aircraft engine parts, etc. These castings range in weight from an ounce or less to 25 lb or more. Heavy production runs are made on castings of about ½ lb each to 5 lb each.

In addition to the various Mo-Cr, W-Mo-Cr, and Ni-Cr-Mo iron alloys, some of the above parts are made of Ni-Hard and Ni-Resist, for which the company is a licensed producer. Certain high-carbon, high-alloy steels are produced in limited quantity for special engine applications.

Production facilities in the foundry are divided into two areas, serviced by common melting, inspection, cleaning, and laboratory departments. The north foundry is the major production area and is devoted entirely to making valve seat inserts and other small castings which lend themselves to production by the flat back, stack molding process. Working area in this section is surrounded by a track type conveyor on which ride small, flat-topped dollies carrying flasks and molds. Switches in the track provide for rolling flasks onto track sections in front of or behind the molding machines and in front of the various furnaces for pouring direct from the furnaces into the mold stacks. Between pouring and shakeout stations is a storage area where poured stacks may be stored awaiting shakeout to avoid congestion on the main conveyor track.

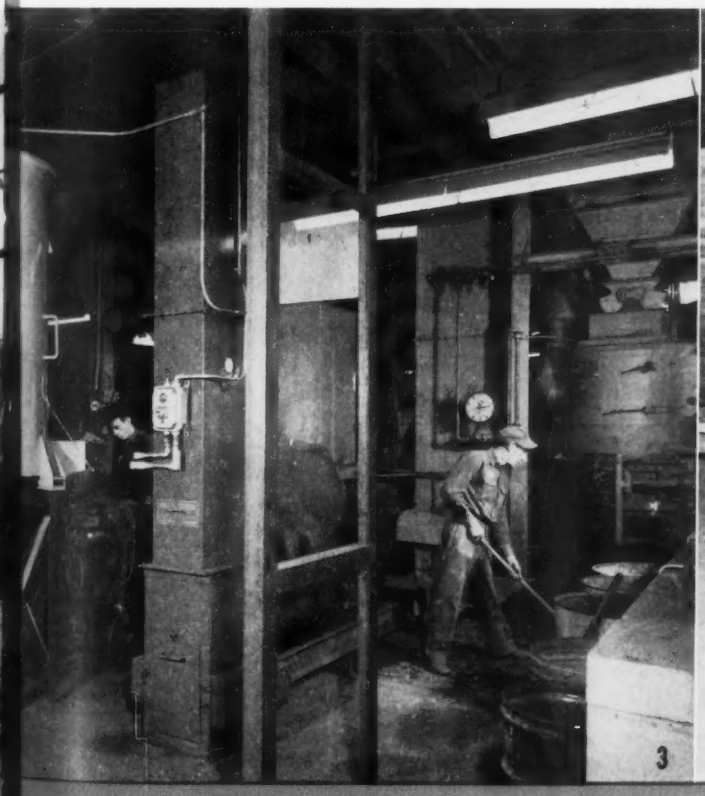


Fig. 3—Sand mixing area with muller, short sand belt, bucket elevator and overhead delivery belt

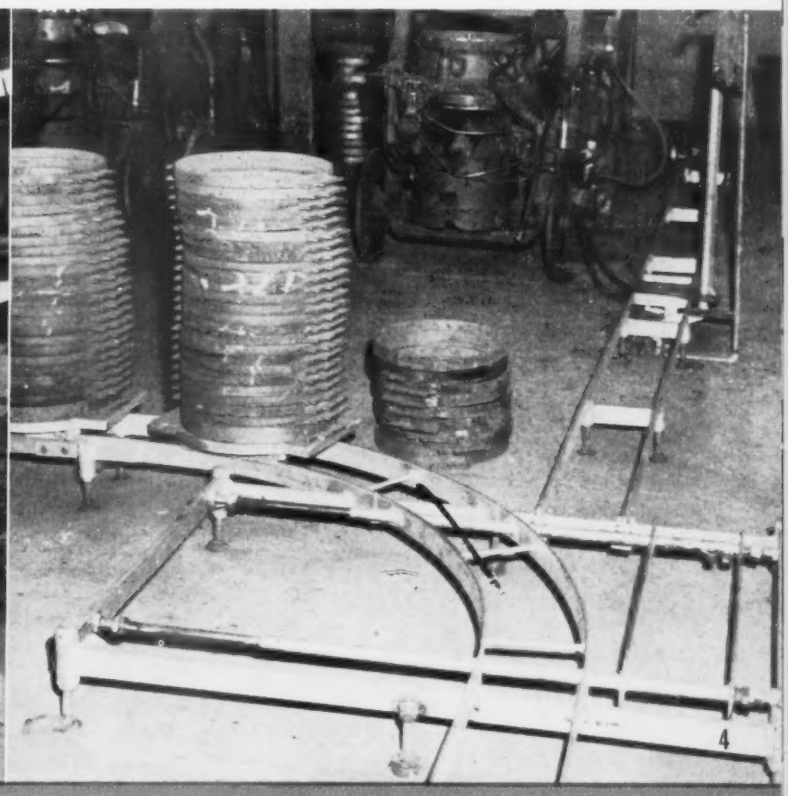


Fig. 4—One of the track conveyor switches. Stacking gage is shown along the track in upper right

The main conveyor actually forms a complete loop so that a stack of flasks travels in a complete cycle from the molding station to the furnaces where the stack is poured, to shakeout, and back to the molding station. With all sand conditioning, as well as molding, being done inside of the conveyor loop, the result is a tight, highly co-ordinated production cycle operating in a minimum of space and with a maximum of efficiency. A high production rate, and high production per man-hour of labor is thus provided.

Molding is done on three squeezer machines specially designed for producing ring type castings in circular flasks holding mold sections used to build up the stack molds. Machines are equipped for automatic stripping and have air-operated heads. Mold cavities are made only in the bottom face of the mold sections, or the copes, the top face being smooth and level to form the drag side of the next succeeding mold section as the stack is built.

In making the molds the flask is placed on the pattern plate which is mounted on the molding machine platen, and a strike-off ring placed on top of the flask. The operator then fills the assembly with sand from an overhead hopper, "tucks" the sand

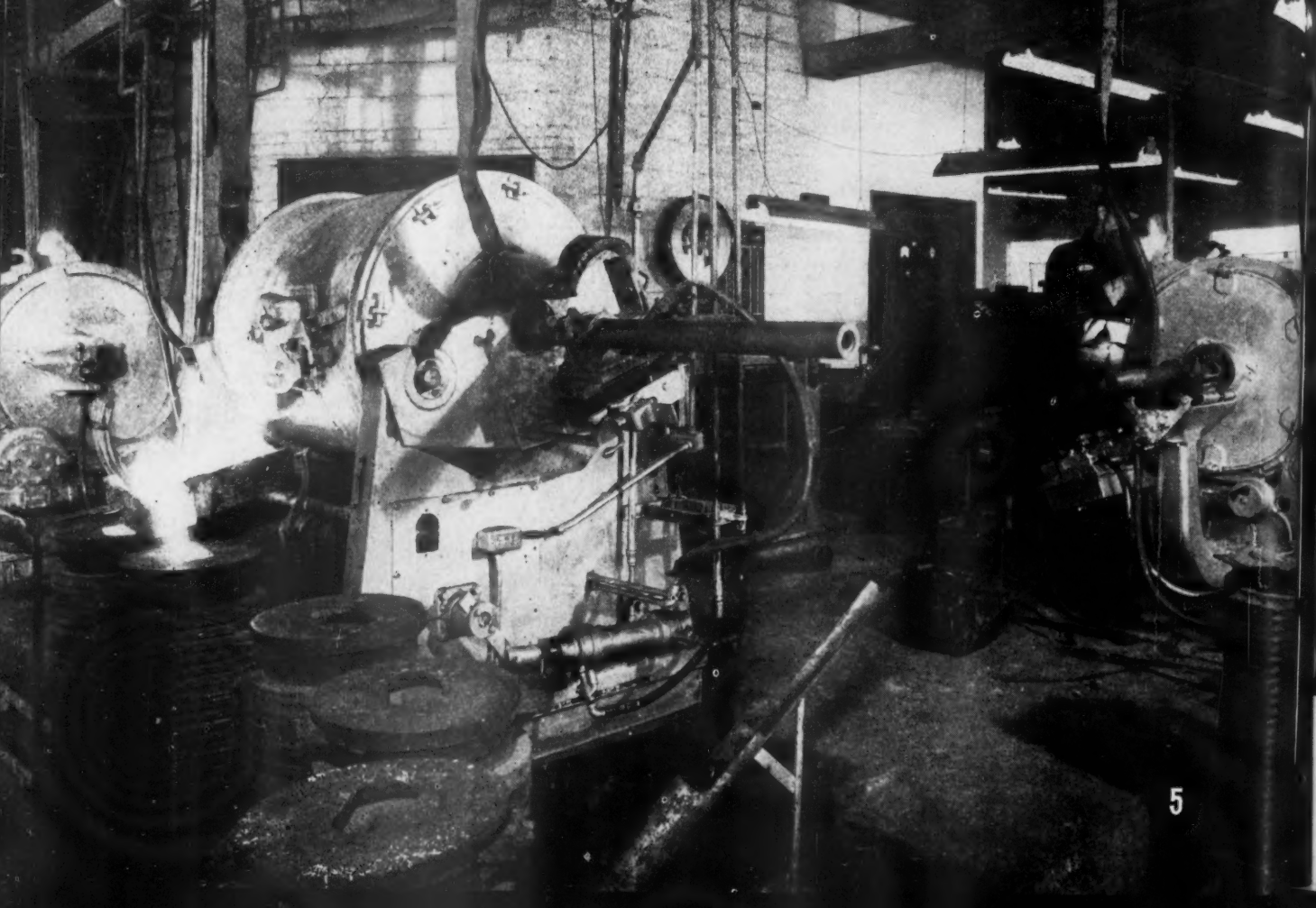
Fig. 5—Melting department has raised floor section forming a concentrated area where charges are weighed and charged into the furnaces. Furnace in foreground is being tapped directly into molds

100,000 Castings a Day

with his fingers around the periphery between the flask and the outer edge of the ring of patterns, and strikes off surplus sand with a bar. Depth of the ring and pressure applied during the squeeze are so correlated that the sand is compressed to about ⅛-in. above the top of the flask, so that when the molds are stacked there is sand-to-sand contact between the sections.

Except for the bottom mold section, each of the sections has a sprue hole punched into the center by a pin mounted on the molding machine platen. The flask used for the bottom is twice the thickness of the other molds, to provide support and insulation. The sprue hole is, of course, not made in this bottom mold, the sprue pin being retracted by air valve control.

In building the stacks the bottom mold is placed directly on one of the dollies resting on the conveyor track. The dolly is kept from rolling by a foot-pedal-controlled movable platform that raises the dolly rollers off the track. These dollies are fabricated aluminum bottom boards equipped with five rollers on



the underside, ball bearing mounted for minimum friction, ease of rolling and smoothness. As the molds are stacked one on top of the other they are rested against a vertical aligning stacking gage mounted alongside the track to keep the mold sections, and consequently the sprue holes, properly lined up.

Each stack contains an average of 22 mold sections, each section containing from 8 to 24 cavities, depending on the size of the particular interest or part being molded. An average automobile insert would run about 16 to 20 cavities to the mold. The cavities are arranged in a peripheral pattern around a circular runner which is fed by radial runners, usually four in number, from the central sprue. Each cavity is fed by a slot gate measuring about 1/16 x ¼ in. or somewhat larger, depending on the weight and cross section of the casting.

After the stack is built, a green sand pouring basin, formed in a round, metal flask, is placed on top and the stack moved along the conveyor and lined up in front of the furnaces. Molds are poured directly from the furnaces, a practice which eliminates the hazard of transporting molten metal and avoids the temperature drop attendant to transferring metal from furnace to ladle to mold. Poured molds are moved farther along the conveyor to the storage section for cooling. The storage area can hold eight movable sections of main conveyor track, and each of these sections can carry five stack molds. The facilities of track layout system for the storage of an ample number of "poured" stacks between the furnaces and the shakeout and for "unpoured" stacks between the molding stations and the furnaces provide a large degree of operating flexibility to minimize the need for synchronizing the molding, melting, pouring and shakeout operations.

Cooled molds are pushed out of the storage area onto the main conveyor leading to the shakeout. A special fixture used in conjunction with an electric hoist running on an overhead monorail lifts the stacks

Fig. 6—Stack mold is lifted off conveyor track by overhead monorail mounted hoist and moved to the vibrating shakeout. Note special grab device

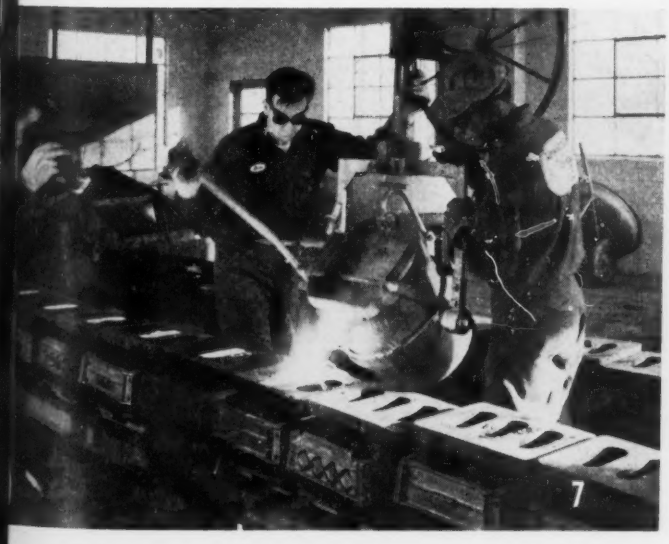


Fig. 7—Covered bull ladle picks up metal from furnaces for pouring molds in the south foundry

Fig. 8—Conveyor track storage area can hold 45 poured molds waiting to cool prior to shakeout

100,000 Castings a Day

by the handles on the bottom flask. Molds are rolled over the hooded, deck type, vibrating shakeout which is mounted about 3 ft above floor level. Sand is vibrated away from the metal, and a few whacks with a hammer on the sprue knocks the ring castings off the gates like needles falling from a Christmas tree. Castings flow off the end of the shakeout and down a chute into a tote box as the sand falls through a ten-mesh screen to an electric-driven belt conveyor. The sprues, gates and runners are tossed into an adjacent bin alongside a 25-hp electric crushing machine which breaks the remelt into size for recharging into the electric furnaces. The sand is carried under a plate magnet equipped with a belt moving at right angles to sand travel, to remove any metal picked up from the sand. A bucket elevator takes the sand from the conveyor and lifts it to a storage hopper above the muller.

Fig. 9—Specially designed tote box with drop discharge door is shown ready to receive cleaned valve seat insert castings from shot blast machine

Fig. 10—Tote boxes, holding castings and remelt, are stacked by lift truck. Remelt is separated by alloy and marked to avoid mix-up in future use

Fig. 11—A corner of the inspection room where inspection and snagging operations are performed

Fig. 12—Compact sand and metal testing laboratory

The 3½-cu-ft-capacity muller is completely automatic, being cycled for predetermined mixing times for the various additions used in blending the sand. Because no cores are used, the foundry is concerned only with molding sand mixes. A natural bonded sand, controlled over a five-screen distribution with average AFS fineness of 120, is blended with bentonites and fireclays to permit operation at the desired moisture content. The system contains about 10 tons of sand which goes through three to four times daily. Prepared sand from the muller goes to a short belt conveyor (about 6 ft long) for transportation to another bucket elevator which deposits the conditioned sand on an overhead conveyor belt, servicing 1500-lb capacity hoppers over each molding machine. Hoppers are filled by plows operated by the individual machine operators. Level of sand in the hoppers is indicated automatically by a system of lights.

A technician makes hourly sand tests for a number of different properties, and adjustments are made as necessary. Properties of sand in the stack molding operation, for example, include moisture at 5 per cent, green compression strength at 11-12 pounds, and permeability at 33-36. Sand tests are made at the foundry in a neat little laboratory well equipped for the job. Hardness tests on castings also are performed in the laboratory by the technician on standard hardness testing machines.

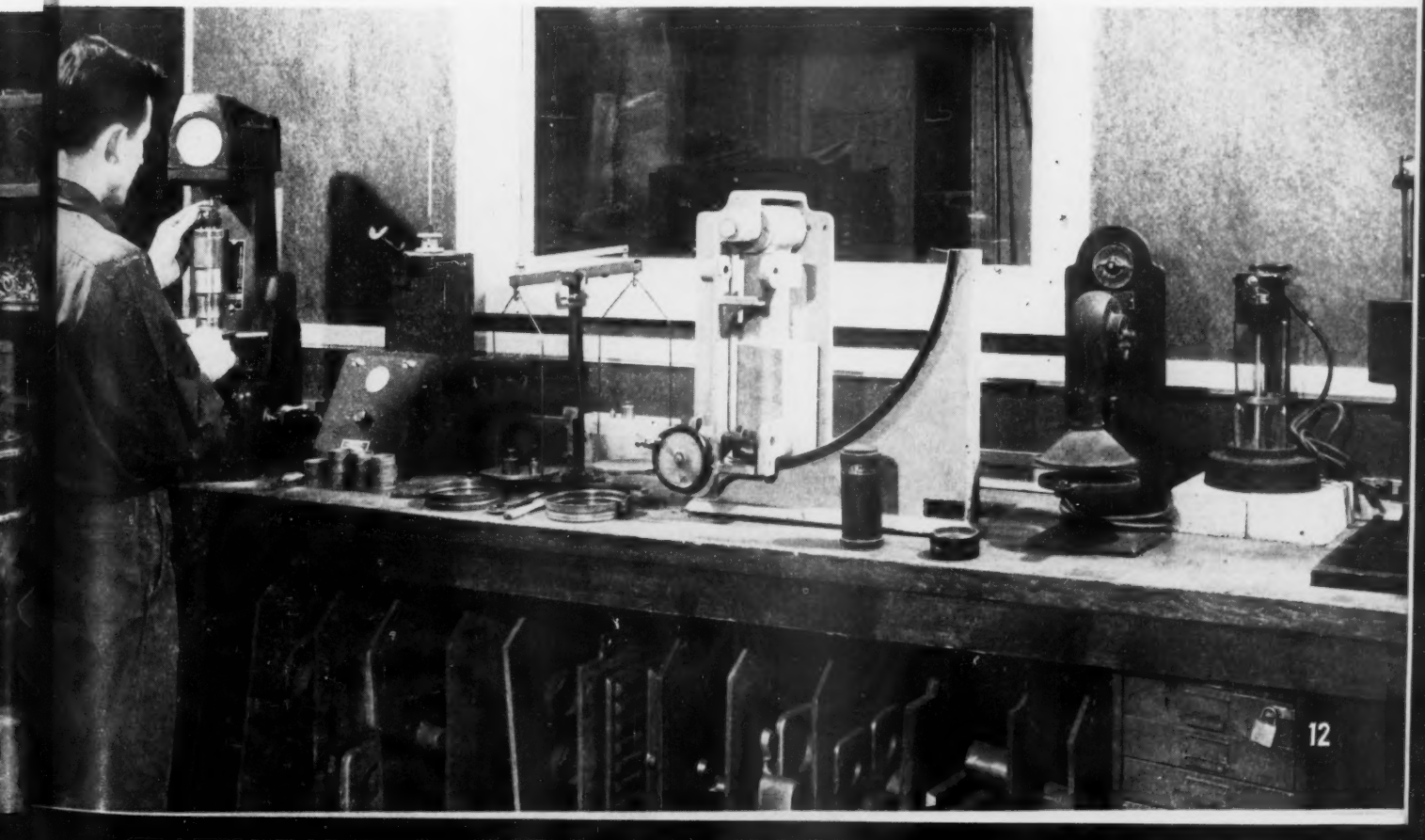
Melting is performed in an area near the center of the building, thus efficiently serving both north and south foundries with a minimum of travel of molten metal and allowing consolidation of all melting activities in a compact area. A small, ventilated cement block vault, ideally located behind the furnaces for efficient power distribution at low voltage, houses the furnace transformers, circuit breakers and capacitors.

The company is served by Consumers Power Co. at 44,000 volts, 60 cycles, 3 phase, brought in through the company's own primary switchhouse. A 44kv to 480 volt, 1000 kva outdoor substation is installed a few feet from the main foundry building. Service at 480 volts is brought underground from the main substation by three-phase, lead-covered cable into the furnace transformer vault where it is stepped down to furnace voltage. Capacitors have been installed for maintaining the power factor at .90 to .95.

Individual furnace control panels are located outside the transformer vault, and indirect arc, rocking-type electric furnaces are located along two sides of the room about 10 ft from the walls. A 700-lb and a 350-lb furnace are located along a section of the conveyor track forming the rectangle around the stack molding area. At right angles to that track section is another track laid down in the direction of the south foundry. It is connected to the main molding area track through a switch. Along this track is located a 250-lb furnace, and a 1000-lb furnace is now being installed in the line. Stack molds may be poured directly from any of the furnaces. A covered, 350-lb ladle traveling on an overhead monorail also may pick up metal from any furnace for transportation to the south foundry.

All of the furnaces are tapped hydraulically, being arranged for nose-tilting which permits pouring direct into molds or into a ladle. All furnaces are equipped with automatic rocking controls to assure a thoroughly homogeneous melt and to keep melting time to a minimum, through high thermal efficiency. All of the larger furnaces are arranged so that the arc may be kept on during tapping if desired.

The 1000-lb furnace is intended primarily for supplying metal to the south foundry, the other three furnaces furnishing metal for the main molding, or "small castings" area. With all furnaces operating, heats are tapped (*Please turn to page* 242)



Nodule Genesis and Growth in

MAGNESIUM-TREATED HYPOEUTECTIC IRONS

This paper, discussing studies of the mechanism of solidification of nodular cast irons, was presented by Mr. Pellini before the 1951 International Foundry Congress in Brussels, Belgium

ABSTRACT

The nodule genesis and growth features of hypoeutectic magnesium treated iron have been studied by examination of specimens quenched at various stages of solidification. It has been deduced that nodules develop in close proximity to dendrites at the end-stage of austenite formation, immediately prior to the start of eutectic reaction. Localized pools of hypereutectic liquid existing by virtue of supersaturation near the dendrite arms provide genesis conditions analogous to hypereutectic melts. Nodule growth is deduced to result from the malleablization of ledeburite.

By R. P. DUNPHY
Metallurgist
Metal Processing Branch
and W. S. PELLINI
Head
Metal Processing Branch
Metallurgy Division
Naval Research Laboratory
Washington

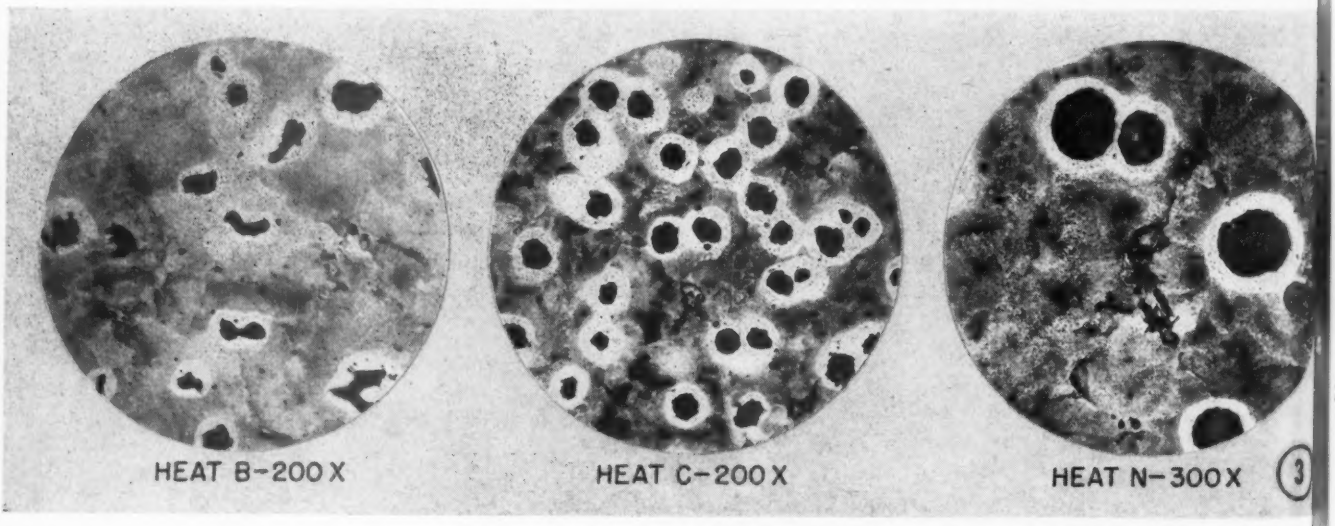
THE mechanism of solidification of nodular cast irons has been the subject of many critical studies, chief of which has been the excellent researches of Morrogh and Williams[1, 2] and de Sy[3, 4, 5]. The former have outlined the solidification mechanism for hypereutectic, cerium-treated irons by metallographic examination of quenched melts and the latter has deduced from metallurgical considerations that the nodules of magnesium-treated hypoeutectic cast irons must originate either before or after eutectic reaction but not during the course of reaction.

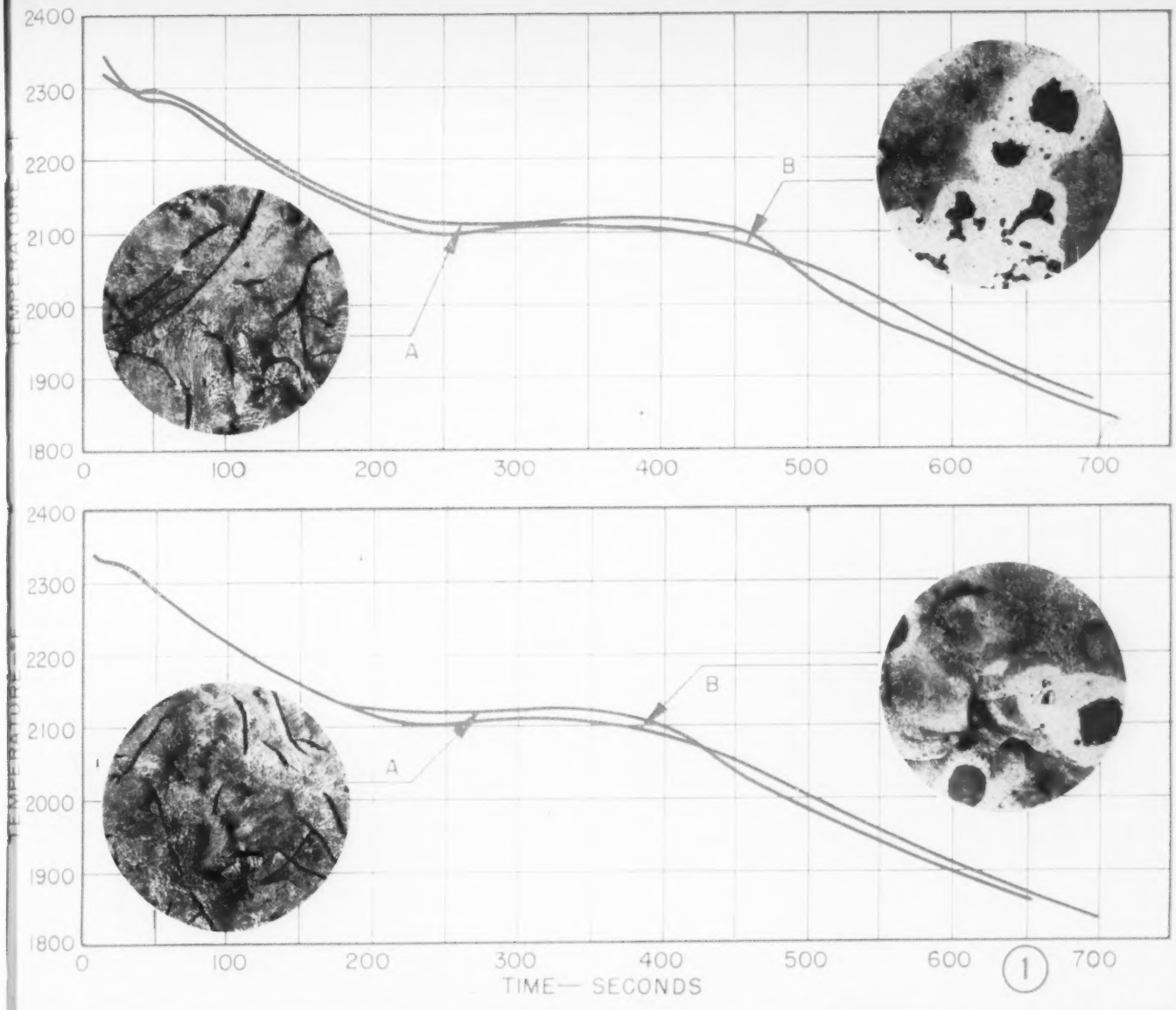
The sequence of events as described by Morrogh and Williams (loc cit) for hypereutectic analyses involves the formation of proeutectic graphite spherulites followed by metastable solidification of the eutectic complex to ledeburite and the subsequent graphitization of the carbide phase. In addition, these researchers have shown that spherulitic graphite can be formed by rapid cooling of a liquid sample. Accordingly, the possibility of such extraneous nodule development in quenching experiments aimed at deducing the mechanism and kinetics of nodule formation must be recognized and accounted for.

Fig. 1 — Cooling curves of 2-in. diam sand castings. Micrograph 300X

Fig. 2 — Cooling curve and quench times for undertreated hypoeutectic iron (heat B)

Fig. 3 — Microstructures, mold-cooled castings

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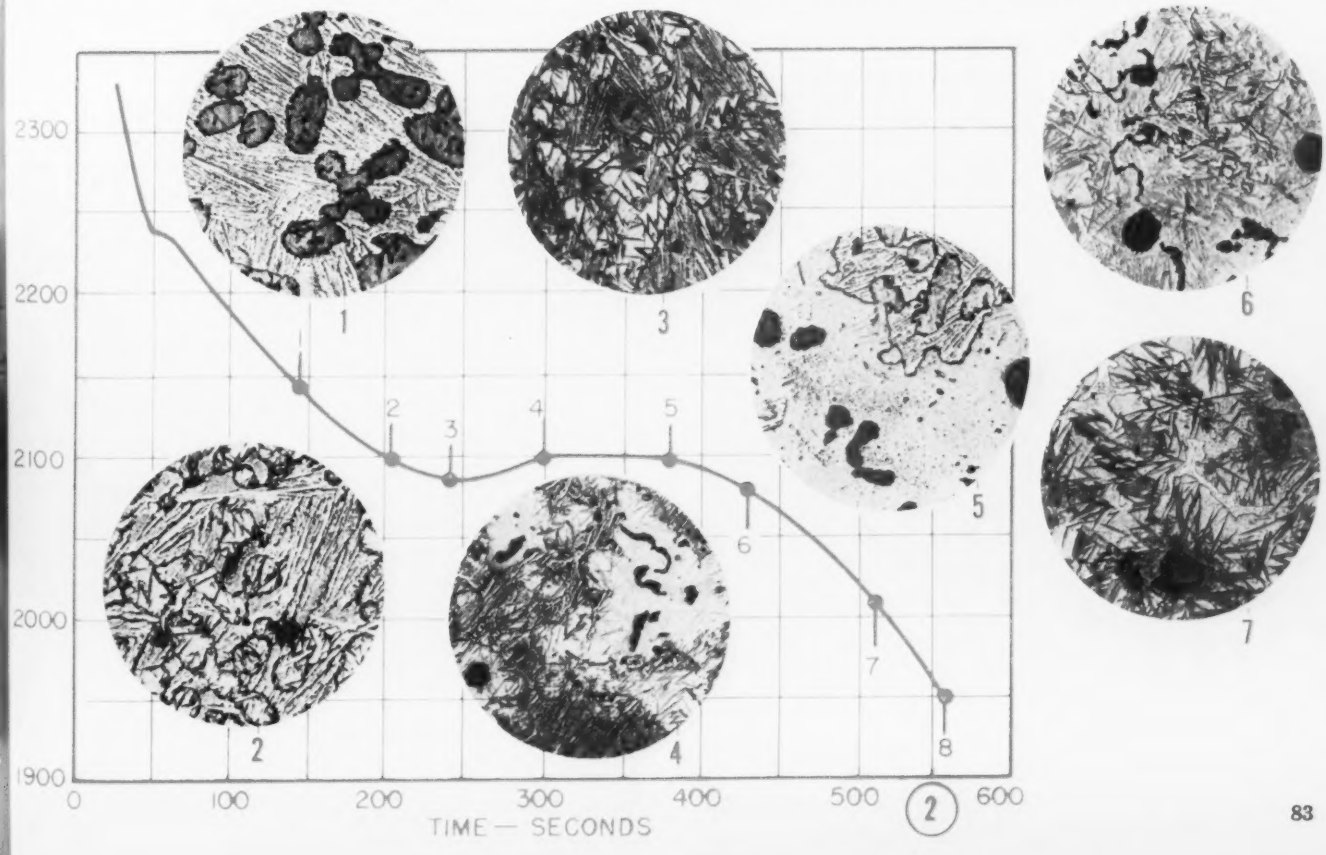
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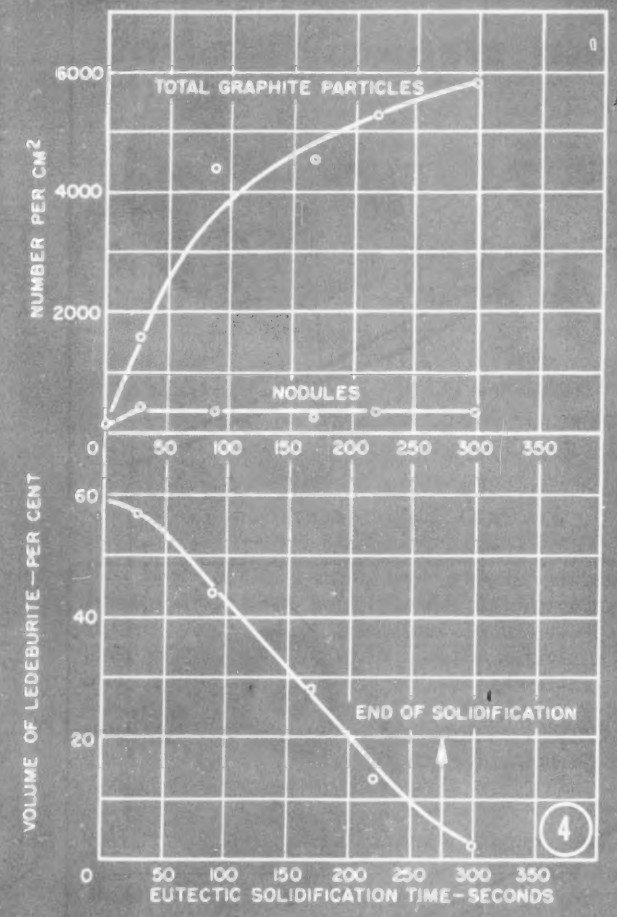


Fig. 4—Graphite nucleation curve and ledeburite remaining after quench for undertreated iron B

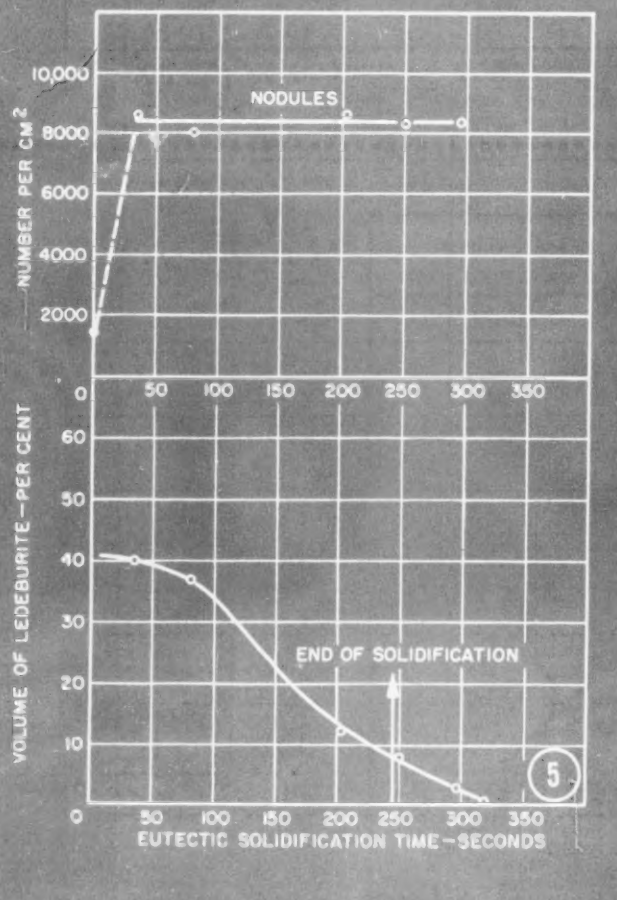


Fig. 5—Graphite nucleation curve and ledeburite remaining after quench for properly treated iron C

The applicability of the magnesium process to hypoeutectic analyses prevents the immediate conclusion that the mechanism of nodule genesis is the same as that deduced for hypereutectic cerium melts. Inas much as control of the process is inherently related to a thorough understanding of the solidification phenomena, it was considered necessary that the solidification mechanism of magnesium-treated hypoeutectic irons be determined experimentally.

Experimental Procedure—All of the melts were prepared synthetically by induction melting charges of Armco iron, graphite, ferromanganese and ferrosilicon in amounts calculated to produce the desired chemical analysis. Magnesium additions were made by tapping the melts into preheated ladles in which was placed calculated quantities of ferrosilicon magnesium (7 to 11 per cent Mg). The flake graphite irons reported were inoculated with ferrosilicon (50 per cent Si) using a similar addition technique.

Studies aimed at interrelating the general thermal and constitutional effects of magnesium additions were conducted with 2-in. diameter, 8-in. high castings having 3½-in. diameter, 4-in. high risers. These samples were cast in a synthetically-bonded sand mold and allowed to cool normally to room temperature without interruption.

Detailed microstructural studies were conducted on samples quenched at various stages of the eutectic reaction. The quench samples were poured into 1-in. diameter 7-in. long cavities in 2 x 2 x 9-in. cellular fireclay insulating bricks. Ten castings were poured in each heat and individual molds were quenched in water at selected times during cooling. The brick molds were crushed immediately upon immersion (estimated time—3 seconds).

Cooling curves were recorded for all castings. In both types of castings the thermocouple tubes were inserted from the bottom and projected upward into the cavity along the casting centerline to a depth of one-half the casting length. Care was exercised to insure that the thermocouple bead was located in the exact geometric center of the casting section. All temperature measurements were made with Pt, Pt-Rh (13 per cent) thermocouples enclosed in two-hole alundum insulators and sheathed in 4 mm OD fused silica protection tubes. The temperatures were recorded by a multipoint automatic recording potentiometer, 1500 to 3000°F scale, with an accuracy of 0.25 per cent and a sensitivity of 0.1 per cent.

In order to provide quantitive data as to the development of the graphitic structures in the castings of quenched samples each specimen was examined at

TABLE 1—Compositions of Test Heats

Casting No.	C	Mn	Si	P	S*	Mg**	Ni	Cu	Cr	No	Ti	V
708A	2.72	.22	2.34	.011	.029	..	.03	.08	.01	.01	.01	.01
708B	2.72	.22	2.34	.011	.029	.08						
704A	2.63	.21	2.21	.005	.036	..	.01	.04	.02	.01	.03	.01
704B	2.63	.21	2.21	.005	.036	.14						
B	3.07	.53	1.95	.007	.024	.08	.02	.08	.01	.01	.01	.01
C	3.01	.47	2.40	.016	.022	.14	.02	.08	.01	.01	.01	.01
N	3.87	.45	2.71	.009	.020	.16	.04	.07	.01	.01	.01	.01

* High sulphur analyses due to insufficient time between magnesium treatment and pouring of castings for flotation of sulphides. ** Nominal.

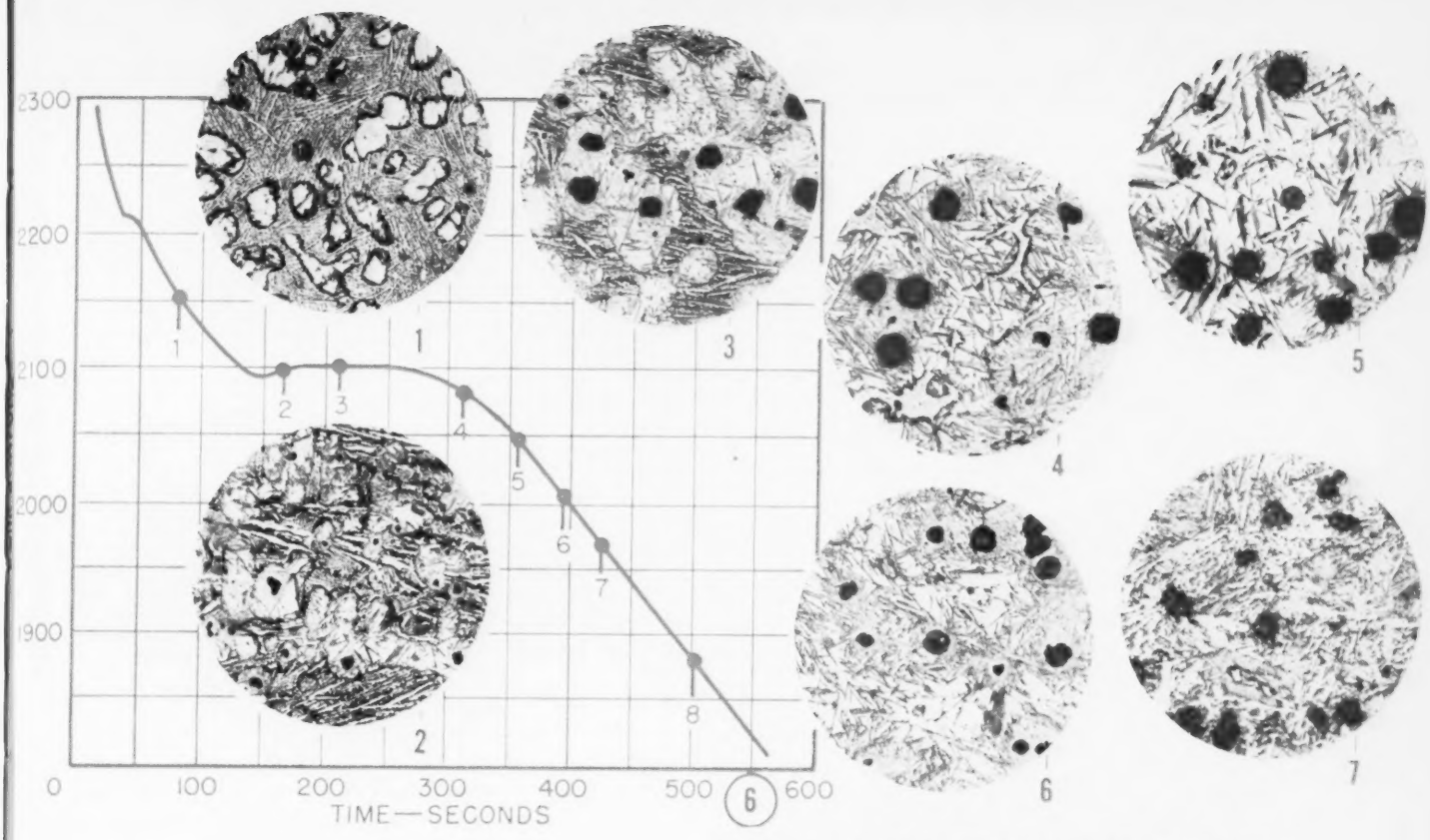


Fig. 6—Cooling curve and quench times for castings of properly treated hypoeutectic iron (heat C)

200X and the number of nodules per unit area was counted during diametrical traverses across the surface. Counts were obtained for approximately 25 areas on each specimen. The volume of ledeburitic areas remaining in these castings following the quench was also measured using lineal analysis[6] by means of the Hurlbut counter[7].

Effects of Magnesium Additions — The general thermal and microstructural effects of magnesium additions to cast irons may be observed from the data presented in Fig. 1. Two heats of similar composition (704 and 708 Table I) are represented with magnesium additions such as to produce predominantly quasi-flake and predominantly nodular graphitic structures. For comparison a part of each of the two heats was poured without magnesuim to produce a completely flake structure.

The solidification of the flake graphite iron (A) in both heats is characterized by initial precipitation of austenite dendrites at the liquidus temperature and continued growth of the dendrites as the temperature falls to approximately 2110°F, at which temperature the eutectic solidifies. This sequence is followed in the solidification of the magnesium-treated irons with the exception that the temperature of eutectic solidification is lowered approximately 10°F and the solidification interval is increased approximately 5 per cent. It is also noted that the normal abrupt termination of delayed cooling noted at the end of the flake iron solidification interval is essentially eliminated. The micrographs of the magnesium-treated irons which solidified at a temperature lower than the flake graph-

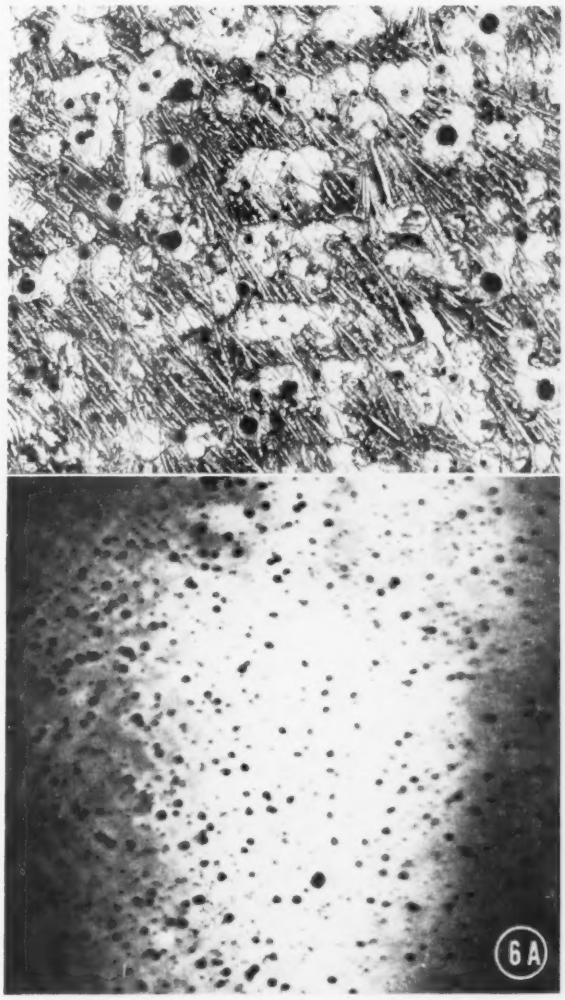


Fig. 6A — Micrograph (above) and microradiograph (below) of Specimen 2, Heat C, from Fig. 6

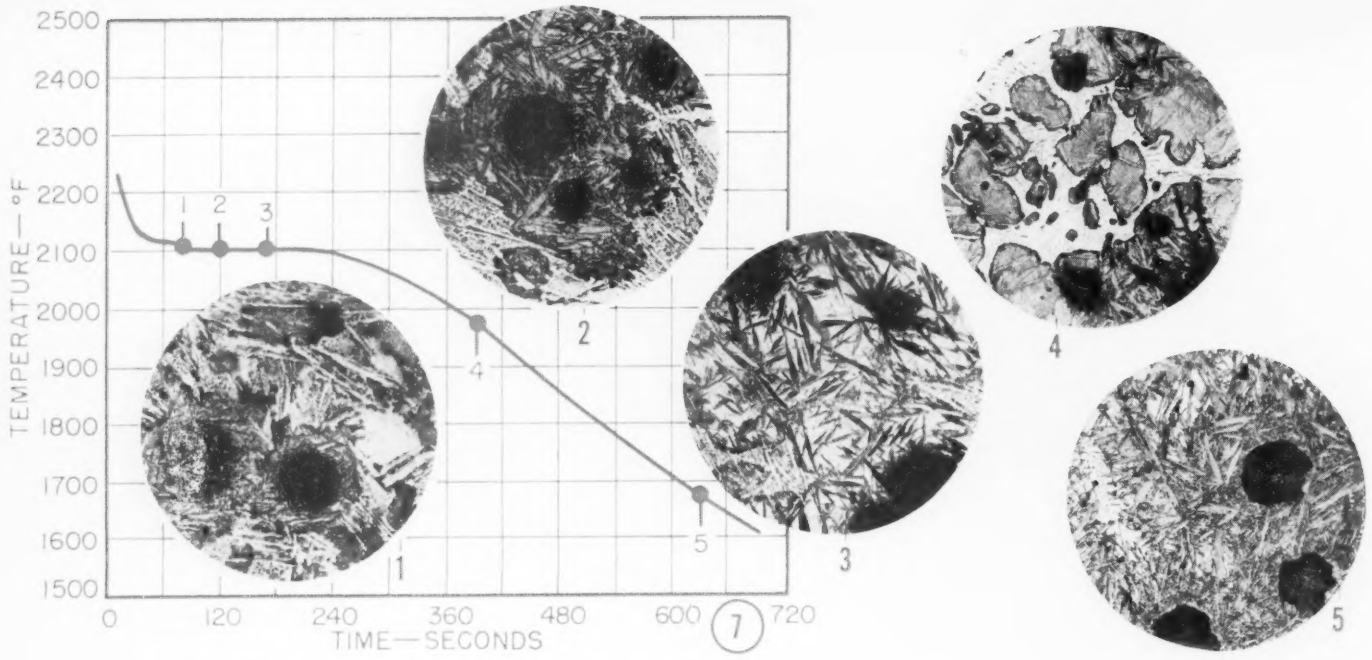


Fig. 7—Cooling curve and quench times for castings of properly treated hypereutectic iron (Heat N)

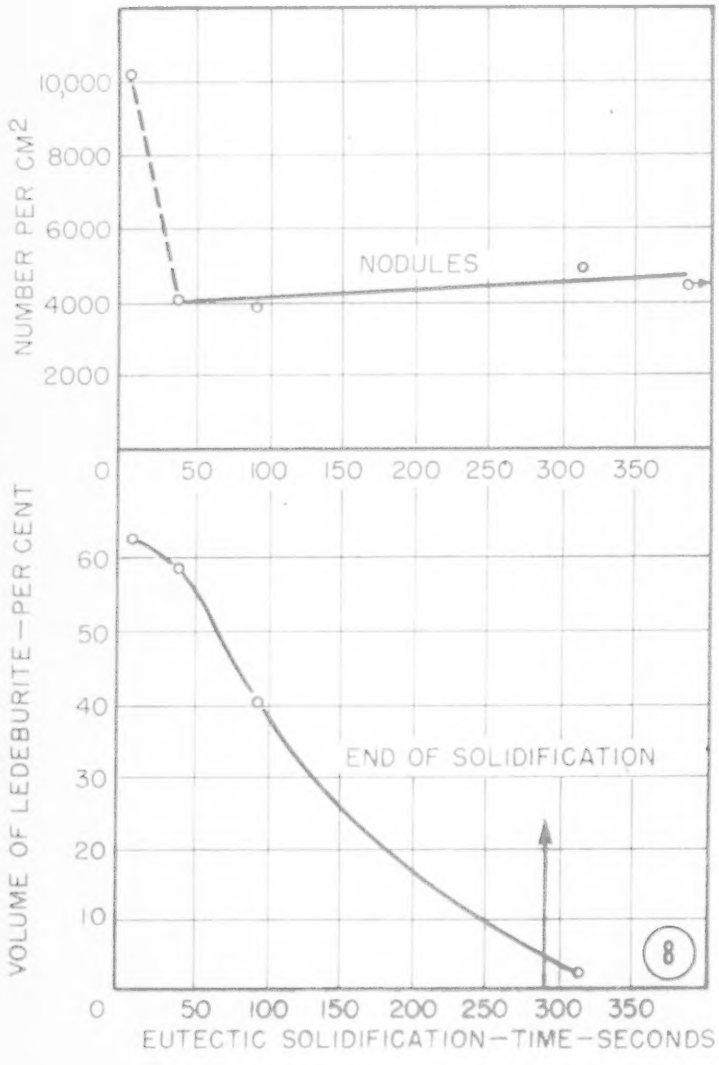


Fig. 8—Graphite nucleation curve and ledeburite after quench for properly treated hypereutectic iron N

ite eutectic temperature contained graphite spherulites and/or quasi-flake graphite.

Since these two structures (spherulitic graphite and quasi-flake graphite) are related to low eutectic solidification temperatures which are determined by the magnesium content, the plan of investigation was aimed at deducing the mechanism of solidification of irons exhibiting these basic structures. Chemical analyses of the test irons are presented in Table 1.

Undertreated Hypoeutectic Iron—The common cooling curve of the individual castings of the first series (B) representing an undertreated iron which developed quasi-flake structures is presented in Fig. 2 with accompanying micrographs taken near the thermocouple tip. The specimens quenched during the late stages of austenite dendrite formation, but definitely prior to eutectic formation (Specimens 1 and 2), showed proeutectic austenite and quench-formed ledeburite; a few nodules were apparent. The specimen quenched at the very first stage of eutectic formation (Specimen 3) showed similar structures with the addition of spherulites surrounded by small austenite rings embedded in the ledeburitic matrix. Small, flake-like graphite structures similarly enveloped in austenite also appeared.

As solidification proceeds further (Specimen 4) the volume of austenite surrounding the spherulites and flake-like graphite increased at the expense of the ledeburite, and an increase in graphite particle size became apparent. Growth of the austenite envelopes and graphite during later stages of solidification (Specimens 5 and 6) occurred with a consequent decrease in ledeburite and thickening and rounding of the flake-like particles of graphite into the familiar quasi-flake appearance.

Specimen 7, quenched after complete solidification, contained similar graphitic structures and small patches of cementite. The volume of the remaining cementite decreased rapidly, approaching almost complete elimination in specimens quenched from 1825° and 1670°F (not shown) and (*Please turn to page* 195)

SELLING THE American Tradition

By WM. J. GREDE
President
Grede Foundries Inc., Milwaukee

WHAT do we mean when we talk about the "American Tradition"? Or "Free Enterprise"? I asked an Australian, who was in my office while visiting this country for the first time, if he and the people in Australia know what we Americans are talking about when we talk about "freedom." After some hesitation, he said, "It is an elusive sort of thing, isn't it?"

My concern is that it is elusive to a lot of Americans. Too many of us like to approach the subject as teachers, when we should approach it as students. We are sometimes accused of talking too much to ourselves. People say the wrong people hear us talk about America. I wonder if that is correct. Should we not approach it more as students and talk to ourselves in order to develop an understanding of this thing we call freedom—Free Enterprise—or the American Tradition. I wonder sometimes if we ought not have more of the good old-fashioned Fourth of July flag-waving speeches so that as we celebrate Independence Day, we are constantly reminded of its significance.

In my judgment, the most dangerous people in our country are not necessarily the communists or the avowed socialists who would change our form of government, but rather those who are socialists and don't really know it. Those who so frequently say, "I'm just a little socialistic myself." There is no such thing as a "little" socialism. Socialism, to be successful, must be complete and must end up in complete dictatorial control. Otherwise, it will not work.

Too many of us, in a misunderstanding about the American Tradition, talk about free enterprise and as soon as there is a shortage of pig iron, rush to the government for help in getting iron. Or, if we are on a local school board, rush to the government for federal aid for our school, or hospital, or highways. No — the most dangerous socialists are here. We must face the problem together to develop a better understanding of this thing we call "freedom."

WM. J. GREDE
Newly Elected President, NAM

Our enemies would divide us into groups, but Americans do not divide easily. For instance, in dividing us up into "big business" and "small business" the Bureau of Labor Statistics makes an arbitrary line at 500 employees—those who employ 500 or more are big business; those who employ less than 500 are small business. I am wondering, however, if we do not divide more realistically on this basis: Anyone whose business is bigger than yours is big business just as the rich and poor divide on the basis of anyone who has more money than you have is rich.

No, Americans do not divide readily into groups. We are individuals and the foundry business is naturally a business of small individual units and, therefore, our competition is not between big and small and rich or poor but with individuals. Whenever we pass the responsibility for any of our problems over to others, whether it be our trade association, our union, or our government, we pass with it control because control always follows responsibility.

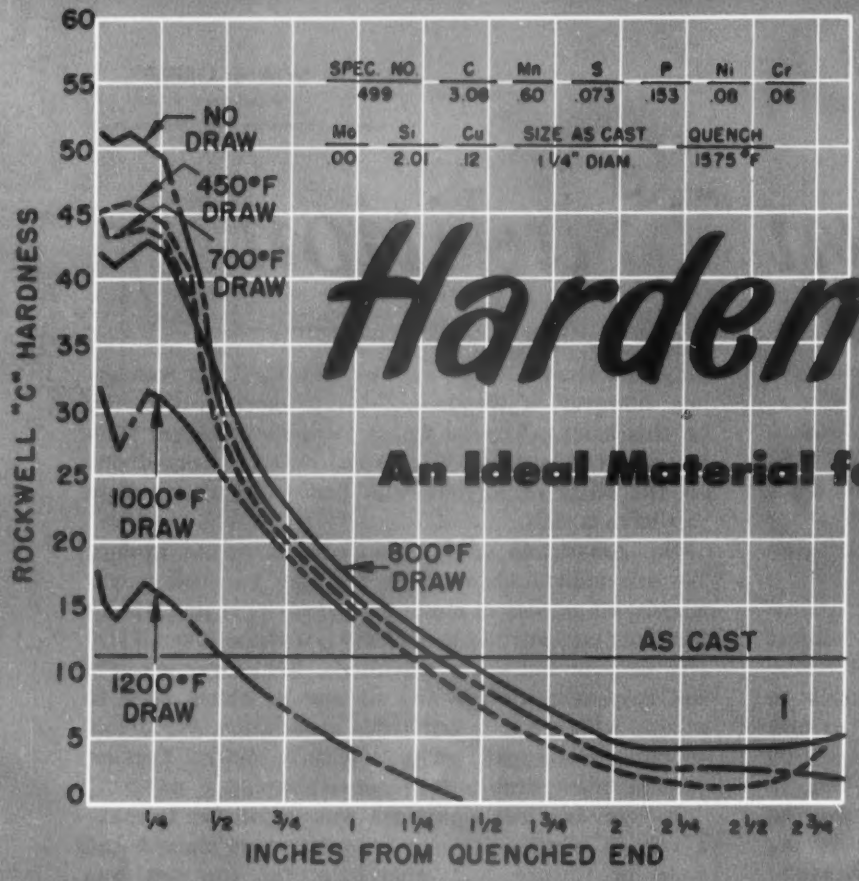
A year ago last summer I was privileged to make a trip to Europe. It had been 20 years since I had been in Europe and, therefore, the contrast was probably more noticeable to me than to folks who go there every two or three years. I think I can illustrate my point a little bit by saying that, as most Americans, I went over to Europe greatly concerned about Europe. When I arrived there, I thought I detected, in comparison with 20 years earlier, a greater similarity between Europeans and Americans in methods and habits. My first impression was encouragement from this comparison. However, as I studied the situation I realized that the similarity, rather than registering progress on the part of the Europeans, was progress on the part of America into the European pattern, and this disturbed me.

I can illustrate this by saying that in 1929 when we were in Germany, I saw a German's paycheck. Those who are old enough to remember a paycheck in America in 1929 remember that it was a simple slip of paper and if it said $50 on the face of it, you took it to the bank and got $50 for it. But in Germany in 1929 the German pay check had a long list of deductions for all kinds of so-called "securities" —old age, health, hospitalization, etc. Look at an American paycheck today. We have difficulty finding room on our paychecks for the deductions as they continue to grow. You understand what I mean by drifting into the European pattern?

In visiting Stockholm, we were shown the marvelous apartment buildings (*Please turn to page* 230)

Hardened Gray

An Ideal Material for Diesel Engine Cylinders



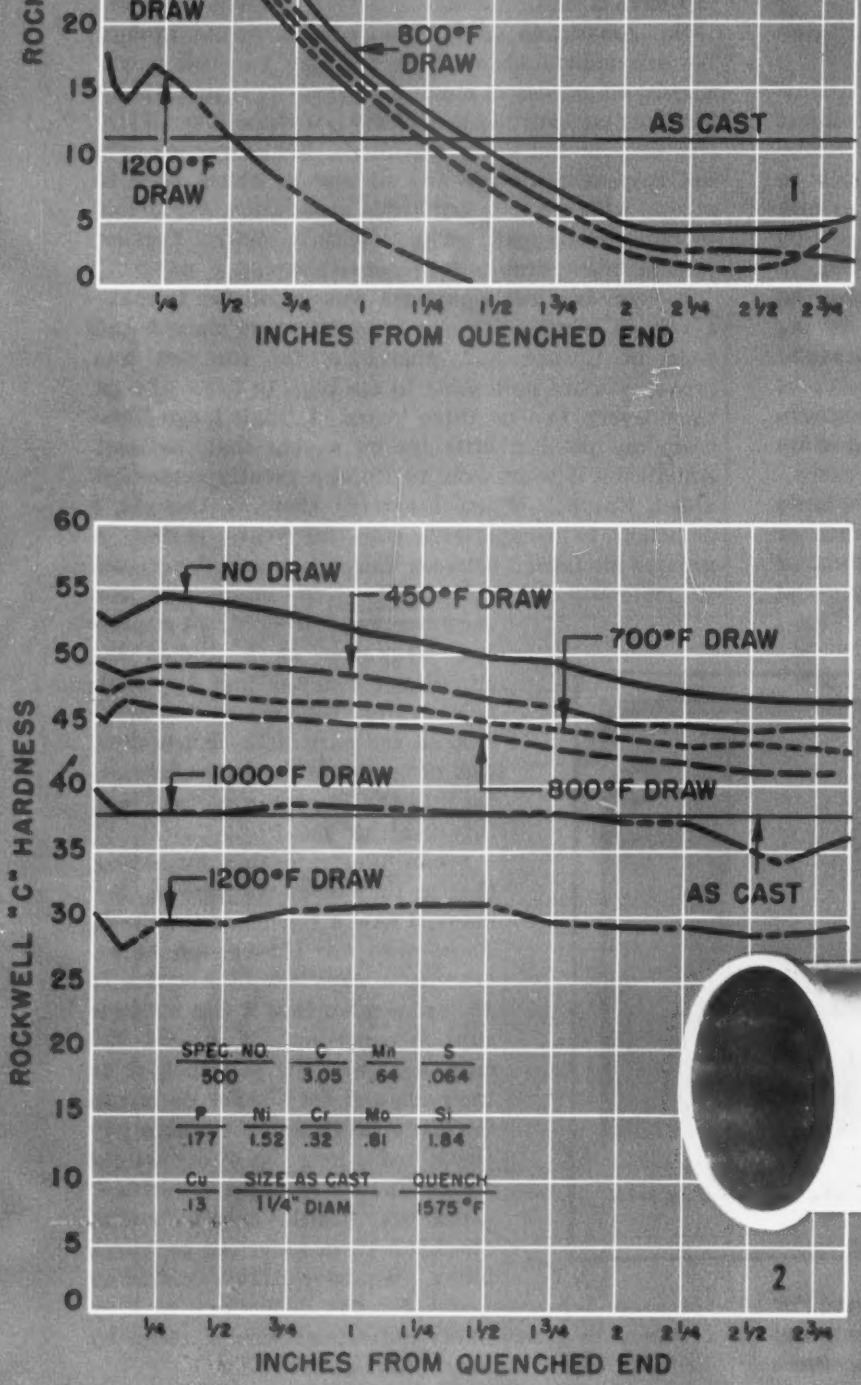
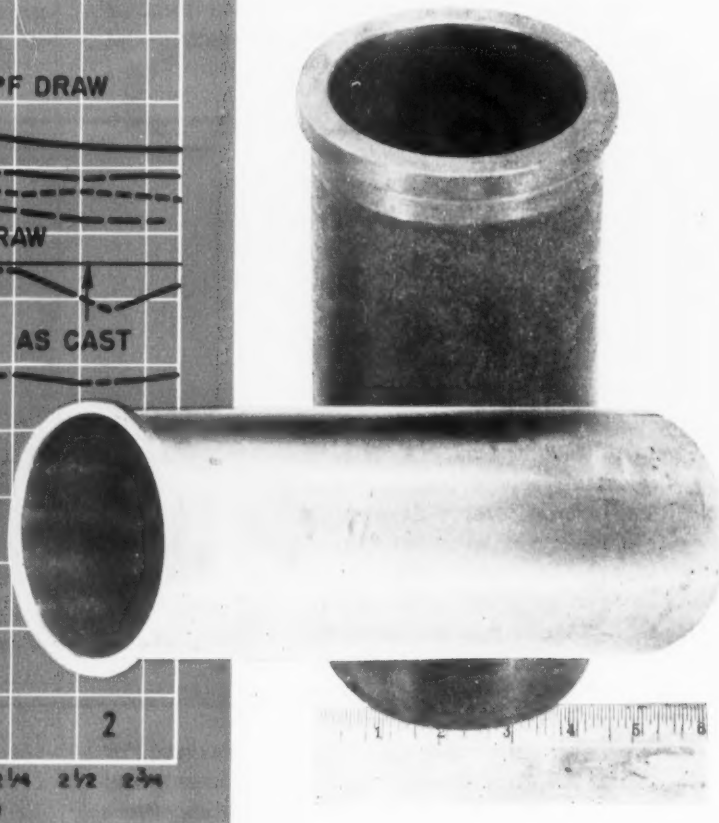


Fig. 1—Hardenability of drawn Jominy bar of plain iron
Fig. 2—Hardenability of drawn Jominy bar of alloy iron

Studies to determine the most desirable type of wear-resistant iron for use in cast cylinder sleeves and liners of diesel engines are described in this first of two articles. Two finish-machined sleeves shown below are the dry type (in front) and the wet type



By GARNET P. PHILLIPS
General Supervisor
Foundry Research
International Harvester Co.
Chicago

...yiron—

...indsleeves and Liners

DURING the early development of the diesel engines manufactured by International Harvester Co. it became apparent that wear encountered with cylinder sleeves of ordinary hardness of around 200 brinell was excessive. A program of research and development was instituted somewhat over 18 years ago to work out a solution of the problem.

Wear Theories—A number of theories had been advanced by various writers on the subject of wear. The relative importance of the various factors involved, including sliding friction, abrasive wear, corrosion effects and the fairly high temperatures involved, had not been evaluated, however. Other factors entering the problem were lubricating efficiency, the maximum explosion pressures developed in the cylinders, and the efficiency of air cleaners and oil filters.

Other factors causing localized wear on cylinder bores of all types of internal combustion engines, some of which apply to cylinder sleeves and liners, have been admirably described by Teetor[1] in a paper on "Influence of Engine Design on Oil Consumption". These design factors were largely eliminated in the comparative wear tests described here by the use of the same type of engine in all tests and by the use of wet-type cylinder sleeves.

In all types of engines maximum cylinder wear occurs in an area of less than an inch below the top of the upper compression piston ring travel. This is the area on which maximum pressure is imposed by the maximum explosion pressure developed by combustion of the fuel.

The fact that maximum pressures developed in the diesel (compression-ignition) engines were roughly twice those developed in gasoline (spark-ignition) engines indicated that this higher pressure was largely responsible for the increased wear encountered in the diesel engines. The diesel engines used in all wear testing described here develop normal maximum pressures of about 750-800 psi and maximum pressures under detonating conditions of about 1000 psi. They are started with a spark-ignition system, using gasoline as a fuel, with a compression ratio of about 6½ to 1 and, after a warm-up, are instantly switched to compression-ignition with a compression ratio of about 14 to 1.

Hardened cylinder liners of the types discussed are used in production in our heavy duty gasoline engines in trucks and power units as well as in all diesel engines.

Causes of Wear—The high pressure of the top compression piston ring against the cylinder wall undoubtedly causes a minimum of lubrication between the two surfaces, with increasing rate of wear as metal-to-metal contact increases. Corrosion of the cylinder walls due to condensation of products of combustion when the engines cool after operation, is another possible cause of wear. Removal of lubricant by condensation of unburned fuel would tend to form metal-to-metal contact when starting the engine, although use of oils diluted with kerosene and similar diluents does not confirm this theory.

The softening effects of heat on the top section, where cylinder walls are exposed to high flame temperatures, is another possible cause of wear. As will be shown, however, hardness tests on hardened diesel sleeves after long periods of service do not show appreciable softening. If this action occurs, the depth of softening is extremely slight and the affected metal

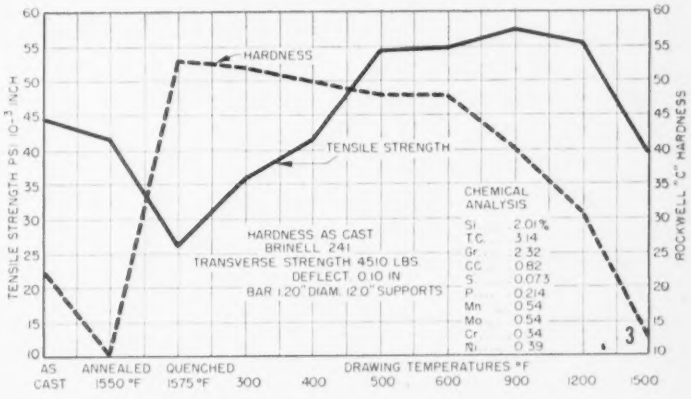


Fig. 3—Properies of heat treated molybdenum-chrome-nickel alloy gray iron. IH Specification E-6; gray iron No. 91. 0.500-in. diam test bars

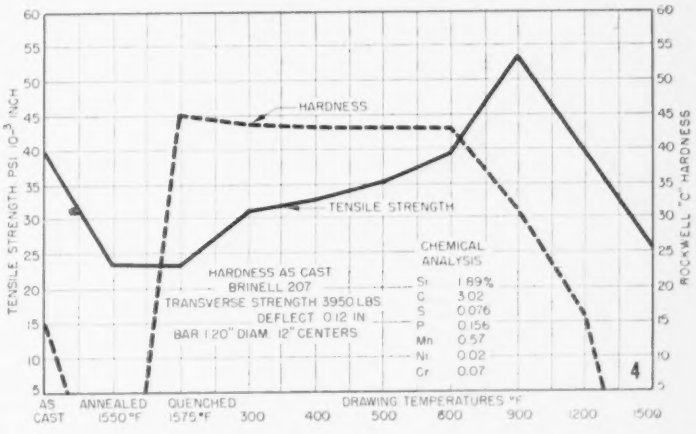


Fig. 4—Properties of heat treated unalloyed low-carbon gray iron. IH Specification E-6; gray iron No. 30. Used 0.500-in. diam test bars

TABLE I—Unhardened Sleeves and Liners

No.	Si	C	S	P	Mn	Ni	Cr	Mo	Bhn	Wear	No. of Tests
1	2.20	3.00	.08	.16	.65	0.30	.30	.50	250	.0062	11
2	2.42	2.97	.09	.18	.60	0.15	.94	.71	269	.0030	2
3	2.56	3.35	..	..	.68	3.47	.32	..	201	.0015	1

TABLE II—Hardened Sleeves and Liners

No.	Si	TC	S	P	Mn	Ni	Cr	Mo	Cu	Bhn	Wear	No. of Tests
1	2.10	3.00	0.08	0.17	0.65	0.30	0.30	0.50	...	500	1.00	20
2	1.86	3.43	0.06	0.18	0.77	2.82	0.45	0.21	...	460	0.83	1
3	2.28	3.10	0.06	0.18	0.77	2.82	0.45	0.21	...	465	0.90	1
4	1.88	3.34	0.04	0.16	0.67	2.79	0.49	0.48	...	490	0.76	1
5	2.49	3.14	0.08	0.18	0.67	2.79	0.46	0.48	...	490	0.76	1
6	2.02	3.17	0.07	0.17	0.83	1.58	0.51	0.51	...	505	0.88	1
7	2.11	3.48	0.09	0.19	0.66	0.22	0.66	...	1.19	475	0.83	3
8	2.07	3.10	0.08	0.16	0.73	0.09	0.10	0.00	0.15	490	0.94	3

must be worn away as formed.

After some years of work on the subject, and with a solution effected in that wear has been reduced to a low figure, positive answers have not been found for all of the factors involved nor have we an exact evaluation of the importance of all factors.

The problem of abrasive wear due to dust and dirt, extremely severe with tractors used in many types of industrial and agricultural services, is largely controlled by the use of efficient air cleaners, breathers, oil filters and air tight seals, and closures at all points of possible dust leakage into engines. If appreciable amounts of dust get into cylinders, wear due to abrasion is rapid regardless of the material used in cylinder sleeves and liners.

Testing Procedure—All wear tests were made in operating engines. The usual procedure is to test sleeves in engines in the engine laboratories. If test results indicate that the new material shows promise, further tests are made by running endurance tests on a 24-hour schedule. If results are still favorable, further tests are made at the Phoenix, Ariz., test plant, where most severe abrasive dust conditions are available and where continuous testing is carried on throughout the year. In these latter tests the engines used are operated in crawler tractors.

Before changing irons in production a further test is made by equipping a number of regular production engines with the new type sleeves and obtaining field service reports on them. Only test results obtained in our engine laboratories and at the Phoenix test plant are discussed in this paper, however.

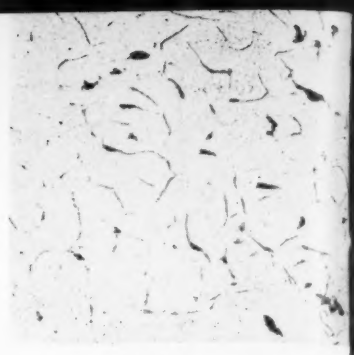
In the early testing of diesel engine sleeves, all the sleeves tested in an engine were of the same composition. Later, as standards were set up and adopted, sleeves standard at the time the tests were made were used in alternate cylinders with new, unknown material under test in the other cylinders. Thus, even though testing conditions varied somewhat due to variations in dust conditions, absolute efficiencies of air cleaners and oil filters, slight variations in lubricating oil qualities and so forth, the standard material and the new material under test were always subject to the same wear conditions as nearly as is possible in an operating engine. All tests made conformed to detail testing instructions issued to personnel involved.

Types of Materials Tested—The types of materials tested consisted of the following broad groups:

1. Gray cast alloyed irons of hardness in the range of 180 to 270 brinell.
2. Hardened (heat treated) alloyed gray irons of a number of types with final hardness in the range of brinell 450 to 550.
3. Special heat and corrosion resistant, highly alloyed irons.
4. Nitrided cast iron.
5. Special steels; hardened graphitic steel; Ihrigized steel.
6. Special sleeves with alloyed white iron inner diameters.
7. Hardened, unalloyed, fairly low carbon gray iron

The gray iron sleeves tested included centrifugally

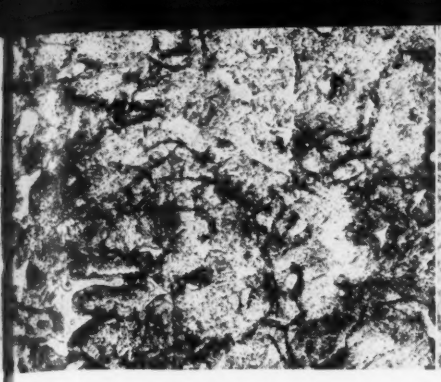
Microstructures of Heat Treated Low Carbon Mo-Cr-Ni Gray Iron



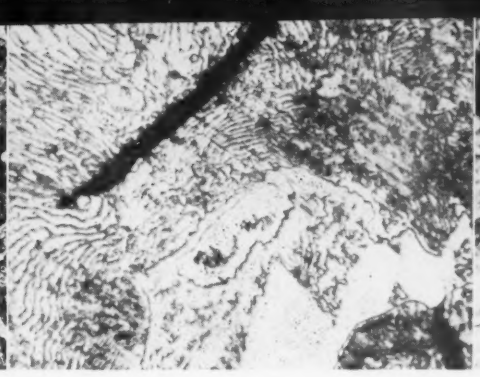
Unetched 100X. As-cast Rockwell C 23. Bhn 241

Nital etched 1500X. Oil quenched 1575°F. Rockwell C

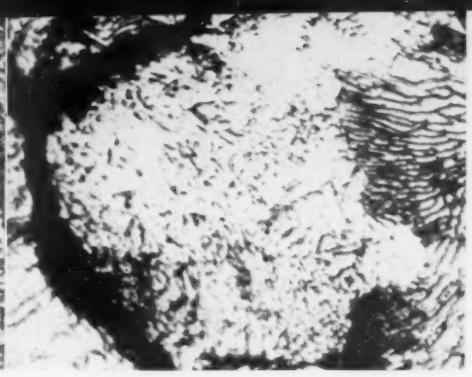
Nital etched 1500X. Oil quench and drawn 600°F. Rockwell C



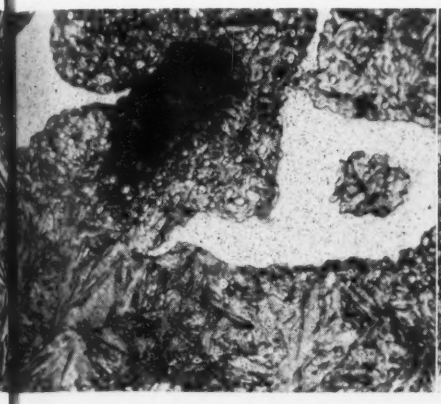
Nital etched 250X.
As-cast Rockwell C 23



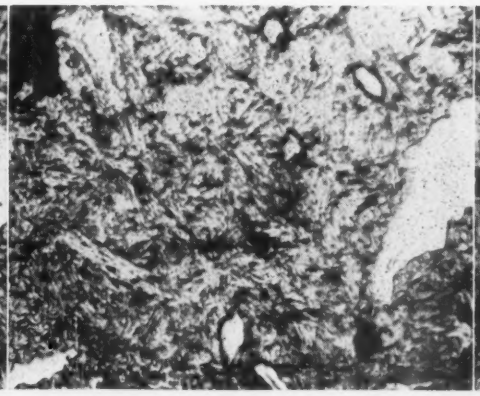
Nital etched 1500X.
As-cast Rockwell C 23



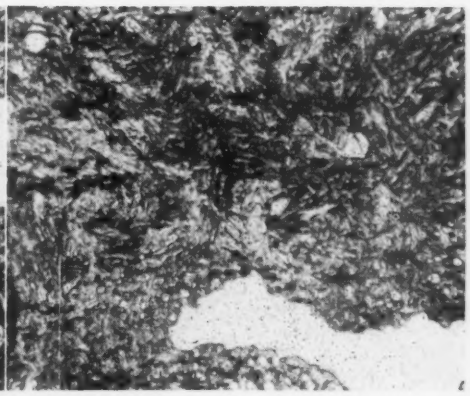
Nital etched 1500X. Annealed 1550°F. Rockwell B 91



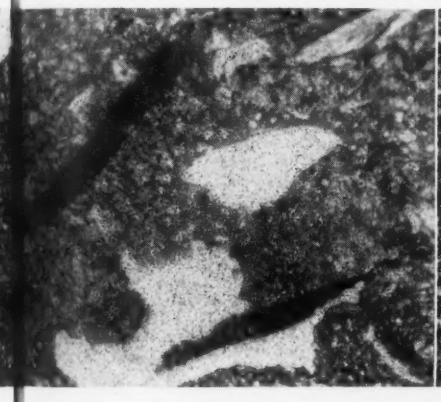
Nital etched 1500X. Oil quenched and drawn 300°F. Rockwell C 52



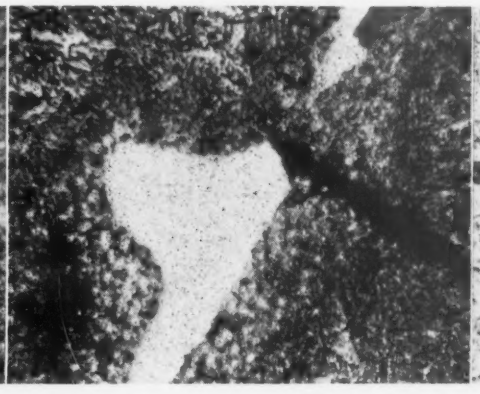
Nital etched 1500X. Oil quenched and drawn 400°F. Rockwell C 50



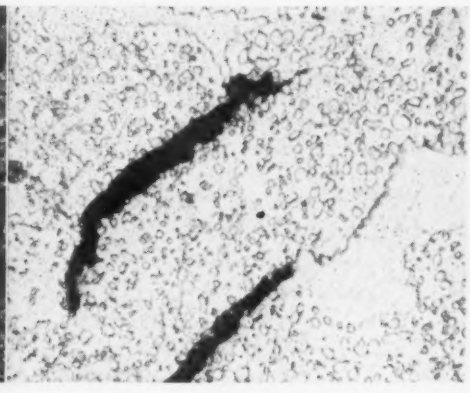
Nital etched 1500X. Oil quenched and drawn 500°F. Rockwell C 48



Nital etched 1500X. Oil quenched and drawn 900°F. Rockwell C 40



Nital etched 1500X. Oil quenched and drawn 1200°F. Rockwell C 31



Nital etched 1500X. Oil quenched and drawn 1500°F. Rockwell B 92

cast and sand cast castings.

As stated previously, wear obtained on cylinder sleeves in diesel engines using regular cupola melted cylinder iron was excessive. A typical analysis of such irons used in early development follows: Si 2.35, TC 3.30, S 0.10, P 0.17, Mn 0.60, Ni 0.16, Cr 0.10, brinell hardness 180-200.

Next, lower carbon, alloyed irons of higher hardness were tested, the hardness being in the range of brinell 220-270. This was followed by tests on hardened sleeves of various compositions as well as tests on special irons and steels as shown above. These tests led to the adoption of the first standard hardened sleeve which was used as a standard of comparison in all wear tests for some years. The three materials which have been used as standard are given below.

First Standard Material—Testing a number of materials led to early adoption of a molybdenum-chrome-nickel alloy gray iron of rather low total carbon, heat treated to a brinell hardness of 450 to 550. The specifications for this material were:

Chemical Analysis — Si 2.00-2.20, TC 3.00-3.20, S 0.10 max, P 0.20 max, Mn 0.50-0.75, Mo 0.40-0.60, Cr 0.25-0.35, Ni 0.25-0.35.

Hardness of Sleeves, Liners—As-cast brinell 220-269; Rockwell "B" 96-104; Hardened brinell 444-555; Rockwell "C" 45-55.

Heat treatment—1. Before machining: Sleeves annealed at 1550° F for two hours and slow cooled.

2. After machining and before honing: A. Heat to 1575° F. B. Quench in oil. C. Draw at 450° F.

Strength — Quenched and drawn: Tensile about 47,000 psi.

Microstructure: Matrix fine martensite containing fine cementite particle at grain boundaries. Graphite flakes fine and of random orientation.

Second Standard Material—Continued testing led to adoption later of a copper-chrome, medium carbon, alloy iron. Hardness specifications and heat treatment were the same as for the molybdenum-chrome-nickel iron just given. Properties specified were:

Chemical Analysis — Si 2.00-2.30, TC 3.25-3.50, S 0.12 max, P 0.25 max, Mn 0.55-0.80, Cu 1.00-1.50, Cr 0.60-0.85.

Strength — Quenched and drawn: Tensile about 40,000 psi.

Microstructure: Similar to that of the molybdenum-chrome-nickel iron.

This copper-chrome iron was equally as good in all wear tests as the previously used standard material and slightly better in some tests. It was somewhat more economical and, with its higher carbon content, somewhat easier to handle from a foundry viewpoint.

Third Standard Material—The third standard material adopted was a rather low carbon, unalloyed iron, heat-treated to brinell 450-550. Testing and work on this iron was hastened by the then impending restrictions on alloys due to the war.

All wear testing done to this time indicated that the primary properties needed in diesel engine sleeves were a fine martensite structure containing fine cementite particles at the grain boundaries; fairly fine, normally distributed graphite particles, with hardness in the range of Brinell 450-550.

To this time alloys had been used in all standard materials to obtain a more fool-proof material from a heat treating viewpoint, and because all wear tests led to the belief that the presence of alloys increased wear resistance. Studies of hardenability, microstructure, dilatometer curves, etc., showed, however, that unalloyed, fairly low carbon iron would respond satisfactorily to proper heat treatment in the fairly thin sections obtained in cylinder sleeves and liners. These sections range from about 1/16-in. in our thinnest "dry" type liner to about 5/16-in. in our heaviest "wet" cylinder sleeve. These metal thicknesses are those of the finish machined sleeves and are the sections hardened.

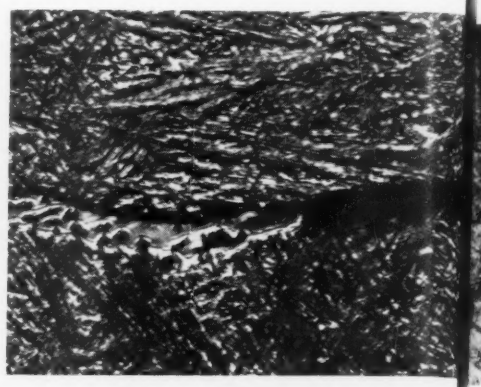
Some modifications were made in rough machining to take care of the chilled small ends of the sleeves. Our standard casting procedure is to cast vertically in green sand, eight in a mold, with the small end up. This results in some chilled white iron at the thin top end of the sleeves, the depth of chill varying inversely with the thickness of the sleeves. An extra ¾-in. of stock is cast on the small end and cut off during the rough turning operation while the turning tool is traveling toward the small end.

Specifications for this material follow:

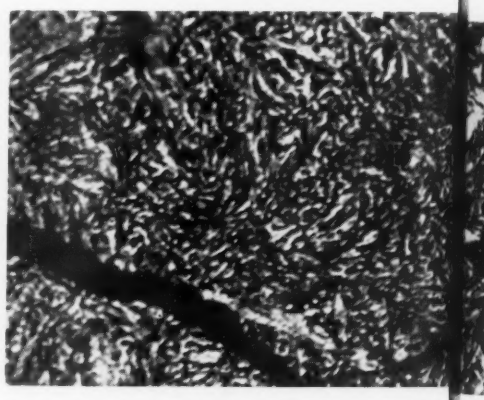
Chemical Analysis—Si 1.80-2.20, TC 2.95-3.25, S 0.12 max, P 0.25 max, Mn 0.50-0.80. Alloys permissible—not required—maximum Ni 0.30; Cu 0.30; Cr 0.25; Mo 0.25.

Microstructures of Heat Treated Low Carbon Unalloyed Gray Iron

Unetched 100X. As-cast Rockwell B 93. Bhn 207



Nital etched 1500X. Oil quenched 1575°F. Rockwell C 45



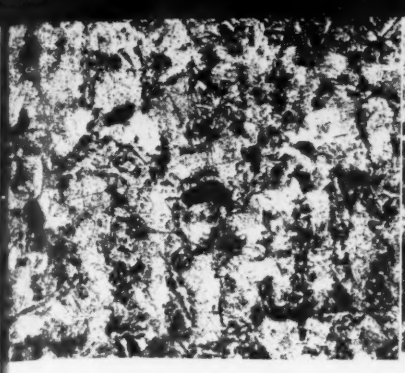
Nital etched 1500X. Oil quenched and drawn 600°F. Rockwell C 43.5

Hardness of Sleeve Castings—As-cast brinell 196-248, Rockwell "B" 93-100. Hardened brinell 444-550, Rockwell "C" 45-55.

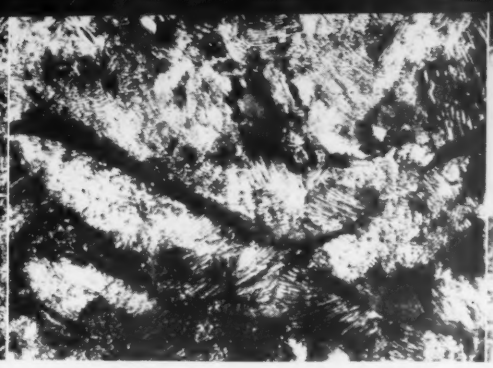
Heat Treatment—1. Before machining: Anneal at 1400-1550° F for one hour; cool in furnace to 700-800° F. 2. Heat to 1550-1600° F; quench in oil; draw at 400-450° F.

Strength — Quenched and drawn: Tensile about 35,000 psi and above.

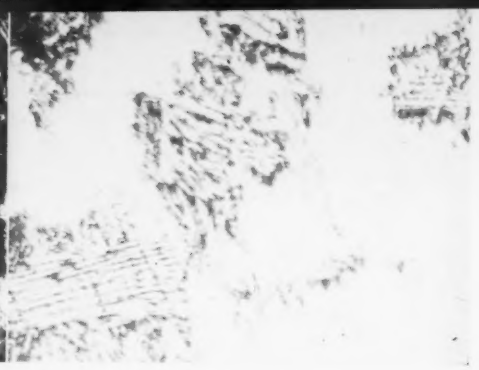
Microstructure: Matrix composed of fine martensite containing fine graphite particles of predominantly random orientation and with fine cementite particles outlining grain boundaries. The use of this material resulted in very satisfactory wear service in the field and in an appreciable, and wartime important, saving



Nital etched 100X
As-Cast Rockwell B 93

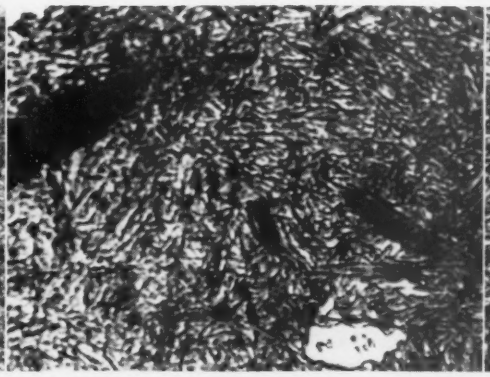


Nital etched 500X
As-Cast Rockwell B 93

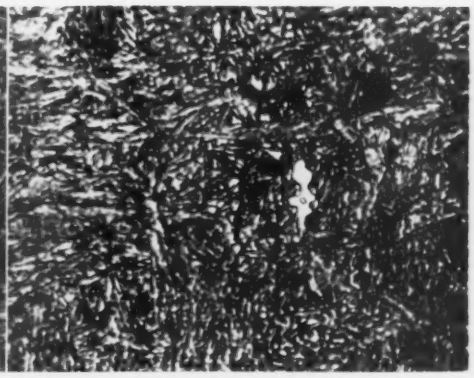


Nital etched 1500X
Annealed Rockwell B 64.5

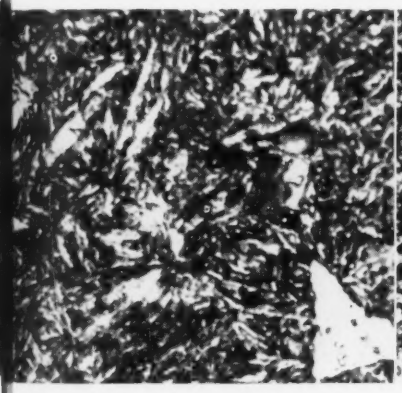
Nital etched 1500X. Oil quenched and drawn 300°F. Rockwell C 44



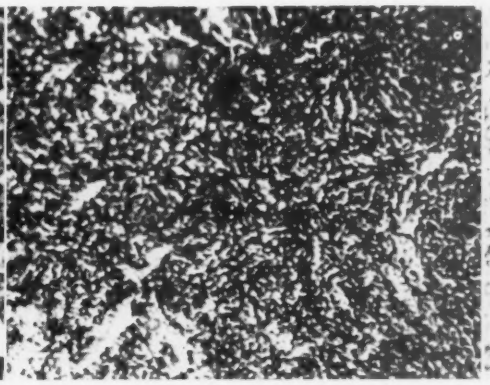
Nital etched 1500X. Oil quenched and drawn 400°F. Rockwell C 43.5



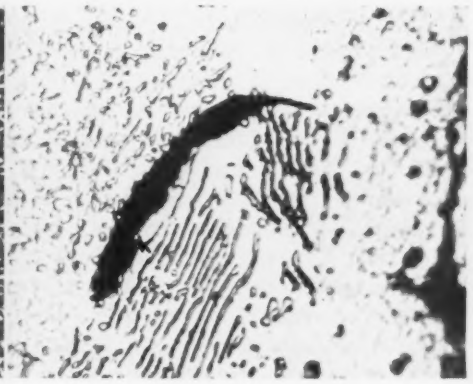
Nital etched 1500X. Oil quenched and drawn 500°F. Rockwell C 43.5



Nital etched 1500X. Oil quenched and drawn 900°F. Rockwell C 31.5



Nital etched 1500X. Oil quenched and drawn 1200°F. Rockwell B 95



Nital etched 1500X. Oil quenched and drawn 1500°F. Rockwell B 65.5

of alloys. However, its use coincided with the development of a corrosion problem on the outside surfaces of wet type sleeves in contact with coolant that is discussed below.

Wear Test Results—Wear test results are reported as average maximum wear for the two standard sleeves and for the two sleeves under test in the case of a four-cylinder engine, per 250 hours operation, the averaged measurements used being those for wear at the top of compression ring travel. Wear is usually greatest during the break-in period when rings are being worn in and seated, and oil consumption is higher than it is after the break-in is over. Thereafter wear is fairly constant over a long period of time and at a lower rate than during the break-in period.

This is well illustrated by test results on sleeves standard at the time the tests were made (hardened molybdenum-chrome-nickel) and copper-chrome sleeves then under test. These showed average maximum wear per 250 hours in a test lasting 517 hours of 0.00124-in. for standard Mo-Cr-Ni sleeves and 0.00099-in. for copper-chrome sleeves. For a test lasting 1188 hours, average maximum wear per 250 hours was 0.00091-in. and 0.00092-in., respectively.

Wear Tests on Unhardened Sleeves—Wear test results on unhardened alloy iron sleeves are shown in Table I. The average maximum wear on the molybdenum-chrome-nickel iron No. 1 in 11 different tests was 0.0062-in. per 250 hours operation. These tests were

TABLE III—Tests on Special Irons

No.*	S	TC	S	P	Mn	Ni	Cr	Cr	Mo	Al	V	Bhn	Rock. "C"	Wear	No. of Tests
1.	2.38	3.00	...	...	1.07	16.00	2.00	6.42	...	...	...	156	.....	3.26	1
2.	0.65	2.31	...	...	0.43	4.28	...	...	...	...	...	...	52–55	0.94	1
3.	0.70	2.36	...	...	0.40	4.60	8.80	...	...	...	...	...	52–55	0.94	1
4.	0.74	1.67	...	...	0.50	0.44	35.70	0.10	...	...	...	269	.....	0.50	1
5.	1.60	1.47	.048	.015	0.55	0.21	26.40	...	...	...	...	311	.....	0.06	1
6.	2.31	3.03	...	...	0.57	...	1.08	...	0.30	1.41	...	File Hard		1.00	2
7.	3.31	2.71	.018	.09	0.47	1.06	...	0.25	0.25	1.60	.06	File Hard		0.70	1

*No. 1—Austenitic cast iron, "Ni-Resist." 2—Alloy white iron inside diameter—chilled. 3—Alloy white iron inside diameter—chilled. 4—High chromium cast iron. 5—High chromium cast iron; test stopped at 274 hours due to excessive blowby, stuck rings and excessive ring wear. 6—Nitricast iron (French). 7—Nitricast iron (French).

TABLE IV—Data on Steel Sleeves Tested

No.*		Si	C	Gr	CC	S	P	Mn	Ni	Cr	Bhn	Wear	No. of Tests
1.	Case	13.63	0.86	0.62	0.24	...	.017	..	.12	.00	236	1.54	1
	Core	...	0.29	...	...	.027	.019	.58	..	..	107	...	
2.		1.04	1.44	1.39	0.05	.027	.015	.41	.07	.03	535	1.25	1

* No. 1 "Ihrigized" steel with 14.0% silicon case. No. 2 "Graphitic" steel; analysis of metal in annealed condition.

some of the earliest made, and improvements in efficiency of air cleaners were effected during and after the tests. Retests failed to change the wear figure appreciably, however. Wear tests on a rather high chrome-molybdenum-nickel iron of higher hardness showed much lower wear values in two tests. One test was made on a high nickel-chrome iron of only 200 Brinell. This showed quite low wear figures. Since wear tests on hardened sleeves of much lower alloy content showed as good or better wear resistance at much lower cost, the high nickel iron was not used in production. It might be of great value, however, in applications where heat treatment is not feasible due to size and design.

Wear Tests on Hardened Sleeves—Wear test results on a number of types of hardened sleeves are shown in Table II. Wear of unity (1.00) shown for type No. 1 was 0.0014-in. per 250 hours operation. This hardened molybdenum-chrome-nickel iron was adopted as standard for production and used as a standard for comparison in wear tests for a number of years. A wear figure of 0.90 means that that particular material wore nine-tenths as much as the standard, or 0.0013-in. per 250 hours operation.

The wear figures shown for a given material where only one test was made should not be taken as absolute, since the average of a number of tests is necessary to establish a more nearly absolute relative wear value.

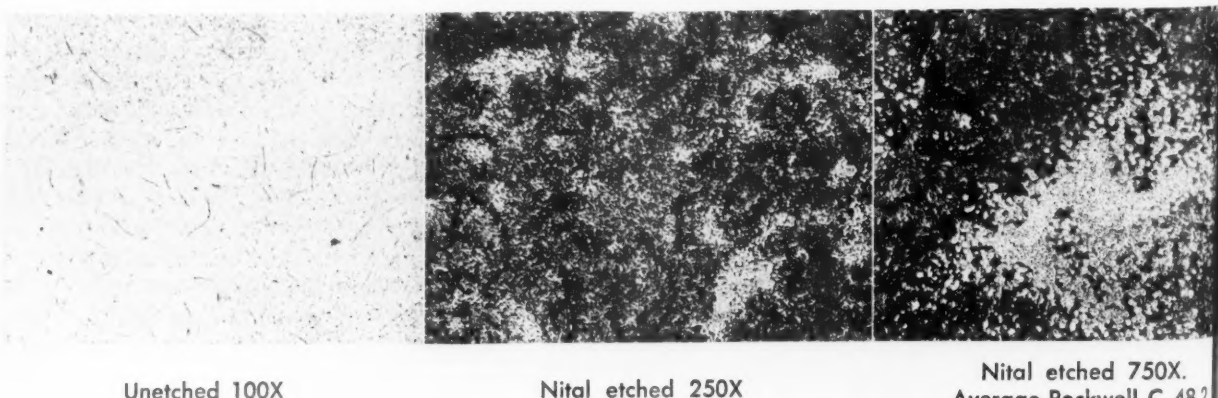
Tests on various materials were made simultaneously. In cases where a test showed a new material to wear somewhat less than standard, the fact that the new material was not adopted as standard or tested further was due to the fact that other materials under test showed about equally good wear resistance and were more economical. The laboratory and Phoenix engine tests on hardened copper-chrome-alloy sleeves illustrate the unavoidable variations found in different engine wear tests. Three such tests gave the following wear values as compared to wear on the then standard hardened molybdenum-chrome-nickel sleeves.

No.	Wear
1	0.68
2	1.00
3	0.80
Average	0.83

Iron No. 7 is typical of the hardened copper-chrome medium carbon iron adopted as the second standard production material. Iron No. 8 is typical of the hardened low carbon unalloyed iron adopted as the third standard material. This iron was adopted in January, 1942.

Wear Tests on Special Alloy Irons—Wear test results on special alloy irons are given in Table III.

Microstructure of Heat Treated Medium Carbon Copper-Chrome Gray Iron Cylinder Sleeve Specimen



Unetched 100X | Nital etched 250X | Nital etched 750X. Average Rockwell C 48.2

Microstructure of 24.0 Per Cent Chromium Cast Iron Annealed

Microstructure of Graphitic Steel Heat Treated

Aqua regia etched 250X. Rockwell C 32

Aqua regia etched 750X. Rockwell C 32

Microstructure of 24.0 Per Cent Chromium Cast Iron Annealed Specimen from Cylinder Sleeve

Here, again, the wear figure is in reference to the standard iron tested. The austenitic cast iron with a brinell of 156 wore 3.26 times as much as the standard sleeves. Sleeves with high alloy, white iron inside diameters were about on a par with standard sleeves. Nitricast-iron sleeves showed about the same wear resistance on one type, while a second type, containing a small amount of vanadium, wore 0.7 as much as the standard.

The high-chromium irons tested deserve special mention. The sleeves were annealed at 1850° F for four hours, furnace cooled to 1000° F and then air cooled. The structure consisted of spheroidized iron-chromium carbides in a matrix of chromium ferrite with massive carbides outlining grain boundaries. Hardness ranged from about brinell 270 to 310. Wear on a 35 per cent chromium grade was about one-half as much as on standard hardened sleeves. The test on a 24 per cent chromium grade was stopped at 274 hours due to excessive blowby, stuck piston rings and excessive piston ring wear. In other words, the high chromium irons showed the least wear of all types tested.

This material is quite expensive, however, difficult to machine and extremely difficult to hone; and it was found that piston ring wear was excessive, with excessive blowby resulting. In special cases this material might prove of great value providing suitable piston rings were developed. In considering possible factors affecting cylinder sleeve wear, it is well to consider the microstructure mentioned above and the fact that this material is extremely heat resistant and has excellent corrosion resistance to many acids.

Wear Tests on Special Steel Sleeves—Wear tests on two types of steel sleeves are given in Table IV. Type No. 1 was a fairly low carbon steel with a case containing about 14 per cent silicon and a brinell hardness of 236. This case had excellent corrosion resistance to many acids. It wore about 1.5 times as much as did the standard hardened alloy gray iron sleeves with which it was tested.

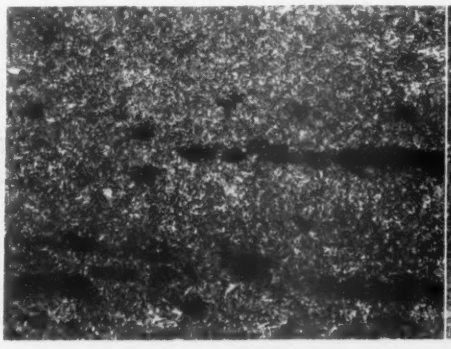
The second type was a hardened (oil quenched and drawn) graphitic steel which showed about 1.25 times as much wear as did the standard hardened alloy gray iron sleeves.

Corrosion Tests—A number of laboratory tests were made on corrosion resistance of hardened and unhardened irons that had been used in wear tests. The corrosive agents used were formic, acetic, sulphurous and sulphuric acids and acetaldehyde, since it was thought that these are formed by the products of combustion in a diesel engine.

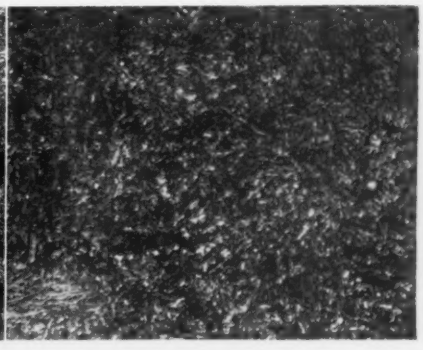
No correlation was found between these tests and wear test results. In general, the unhardened irons had better corrosion resistance than the hardened irons, yet the latter, in general, had from three to five times the wear resistance of the unhardened irons. These tests indicated (*Please turn to page* 222)

Microstructure of Graphitic Steel Heat Treated Cylinder Sleeve

Unetched 100X



Nital etched 250X



Nital etched 750X
Average Rockwell C 54

Space Limitations Dictate

Foundry Layout

By HANS BRANDERS
General Manager
Warkaus Engineering Works and Shipyards
A. Ahlstrom Co., Warkaus, Finland

THE PURPOSE of this article is to describe the layout of a foundry, which, because of its peculiar dimensions—long and narrow—presents some characteristics deviating from the standards commonly used in foundry operation.

The engineering works of the A. Ahlstrom Co., Warkaus, Finland, was founded about 100 years ago. According to practice predominating in Scandinavia and Finland at the time, the works was erected close to a waterfall, which supplied the power needed for driving the different machines by direct drive from a water turbine.

Products of the Warkaus engineering works, which comprised a machine shop and foundry, were various kinds of medium-size machinery for the domestic market. At the end of the 19th century the activities changed over to shipbuilding, and a shipyard was erected on a peninsula, about one mile from the old site of the works. Eventually the activities of the works were moved to the new site, where modern shops were built, mainly after 1930.

The only department left at the old site was the foundry, including a pattern shop and pattern storage. The foundry building itself was a wood-frame structure and the maximum yearly production was about 500 tons of finished castings. In order to centralize the company's activities, it was finally decided in 1946 to discontinue operation of the old foundry and to build a new one adjacent to the main engineering shops. To carry out this decision proved somewhat difficult because the crowded site of the engineering works offered few opportunities for plant expansion or additions.

A requirement in planning the location of a foundry having a specified capacity and size is that easy access by railroad be provided, to minimize the cost of handling raw material. The only area available at Warkaus was a narrow strip of land, 75 x 750 ft, situated between two railroad sidings, one belonging to the company, the other to the government railways.

It was at once realized that the form and layout of a foundry erected on this site would deviate considerably from what hitherto had generally been considered standard planning. The foundry building (Fig. 3) also can be seen in the right upper corner of Fig. 2. At the far left is the administration building, and in between are the machine shops and the plant and structural fabrication departments of the engineering works.

Fig. 4 shows the general layout of the foundry building. Because the track sidings converge at one end, and the building was planned to follow as closely as possible the space available, the foundry molding bay and the cleaning department are situated in a part of the building which is truly rectangular. The remaining part of the building, consisting of two floors and containing all auxiliary departments, narrows slightly at the end. The second floor at this end incorporates sand and metallurgical laboratories, a cafeteria and wash and locker rooms. Because the sidings closely follow the 300-ft-long sidewalls of the building, no wings or bays on the building proper could be provided.

The conditions just described made it necessary to

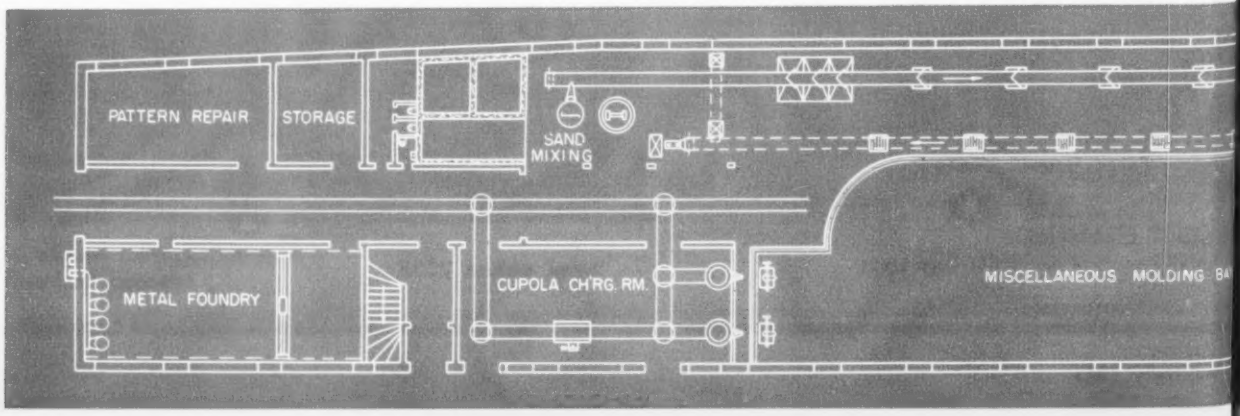


Fig. 1—Rack loaded with cores being lowered by overhead crane into pit type baking oven. This type of oven proved best solution to space problem

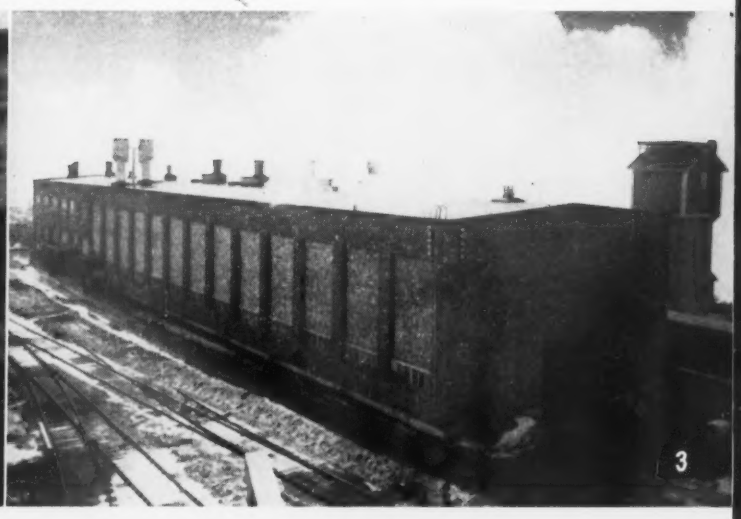


Fig. 2—General view of Warkaus engineering works and shipyards. Foundry shown at right background

Fig. 3—Foundry building is located on a narrow strip of land. Raw material storage is at right

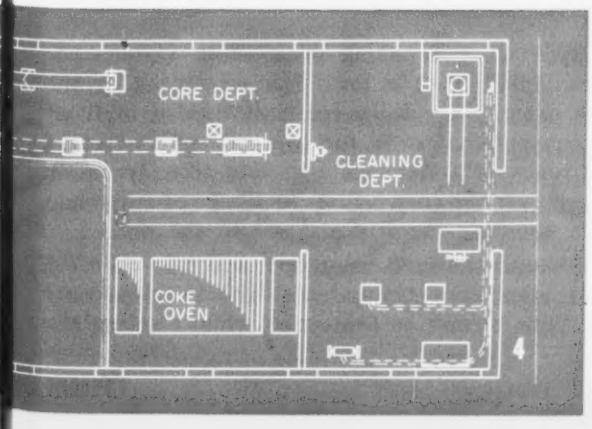


Fig. 4—General layout of the foundry. Laboratories, cafeteria and wash and locker rooms are on the second floor at left end of the building

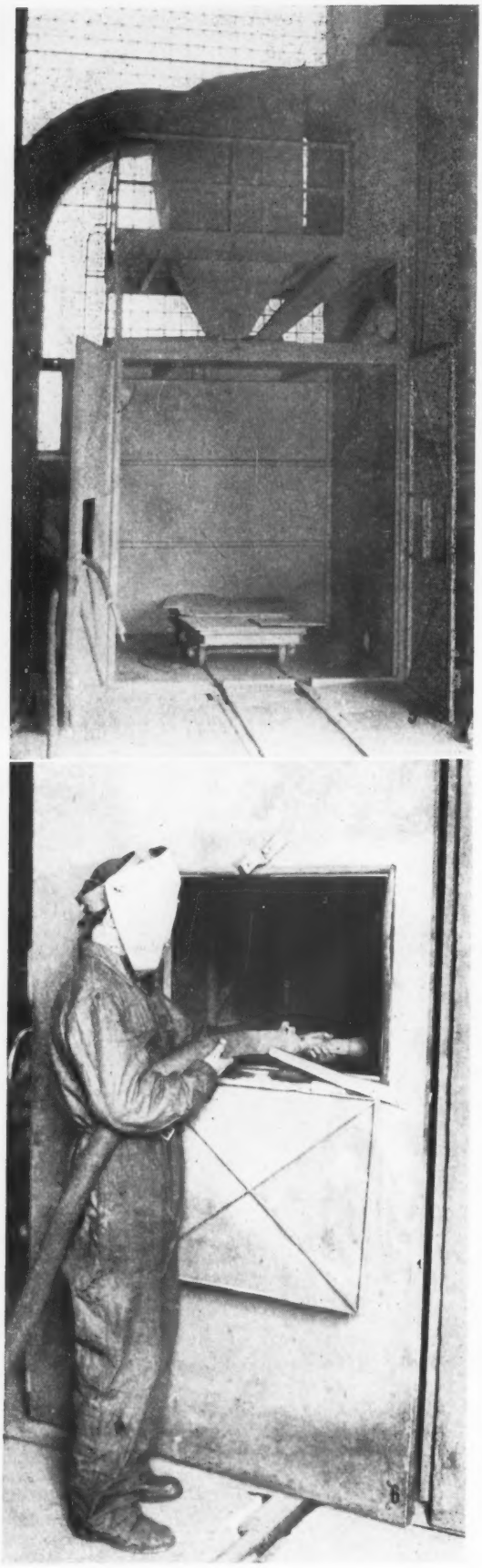


Fig. 5—Sand blasting room. Revolving table rotates car on which castings are loaded as operator (Fig. 6) standing outside the room handles blast nozzle through door opening

place the cupolas at the end of the molding bay. Storage space for pig iron, coke, scrap, flasks, etc., is provided outside the foundry between the track sidings at the end of the building shown in Fig. 3. All these materials are brought in through the door at the end of the building to the departments where needed.

Cupola charging is handled from the ground floor by two men. Drop-bottom charging buckets are handled by hoists, running close under the cupola charging room roof. The same men bring in the raw materials and break up the pig iron and scrap.

Sand is conveyed by belt from the mixing department to storage hoppers in the molding bay. Used sand is returned by a below-floor conveyor belt to a bucket elevator which raises it to bins located above the mixer. A short transverse conveyor belt brings in new sand from cars unloading on the track siding, dumping it on the return sand belt for discharge into the storage bins. Sand from these bins is moved to the mixer by a traveling measuring hopper.

An interesting solution was arrived at in determining the location of the core ovens, and in this respect the foundry is really rather unique. It was impossible to follow the common practice of placing the ovens in wings from the molding bay proper. An alternative arrangement would have been to protrude the ovens into the cleaning department; however, this location was considered less desirable than placing the ovens under the floor level in the corner of the molding bay nearest the cleaning department. The two ovens, 10 x 13 ft and 6½ ft deep, are oil fired and heated by forced draft air circulation.

Core Racks Handled by Crane

Cores are placed on pallets or on racks, depending on their size, which are lowered and raised by crane. The arrangement can readily be seen in Fig. 1. At the left is the core oven proper and a rack holding small cores being lowered. In the background is a row of rectangular openings leading to a duct from which the fan, shown in the back of the pit at the right, draws the circulation air. The oil burner protrudes into the duct leading from the blower to the front side of oven, where the heated air is forced into the oven through a corresponding row of rectangular openings.

The oven consists of two similar sections separated by a removable partition wall. If large cores are to be baked, this wall can be removed. Covers for the ovens are sturdy, well insulated hatches.

A considerable part of the molding is done in dry sand which consequently means considerable mold baking.

This type of core baking oven offers various advantages. Initial cost is low. Space required by the pit type oven does not exceed that needed in front of the conventional oven for loading and unloading cars or racks. Maintenance cost is extremely small, and experience has shown little breakage of cores and molds in handling them in and out of the pits.

Fig. 5 shows the sand blasting room. The operator (Fig. 6) stands on the outside, and requires only a fairly light helmet as protection while blasting the

Fig. 7—View of the molding floor. Relatively little molding is done by machine

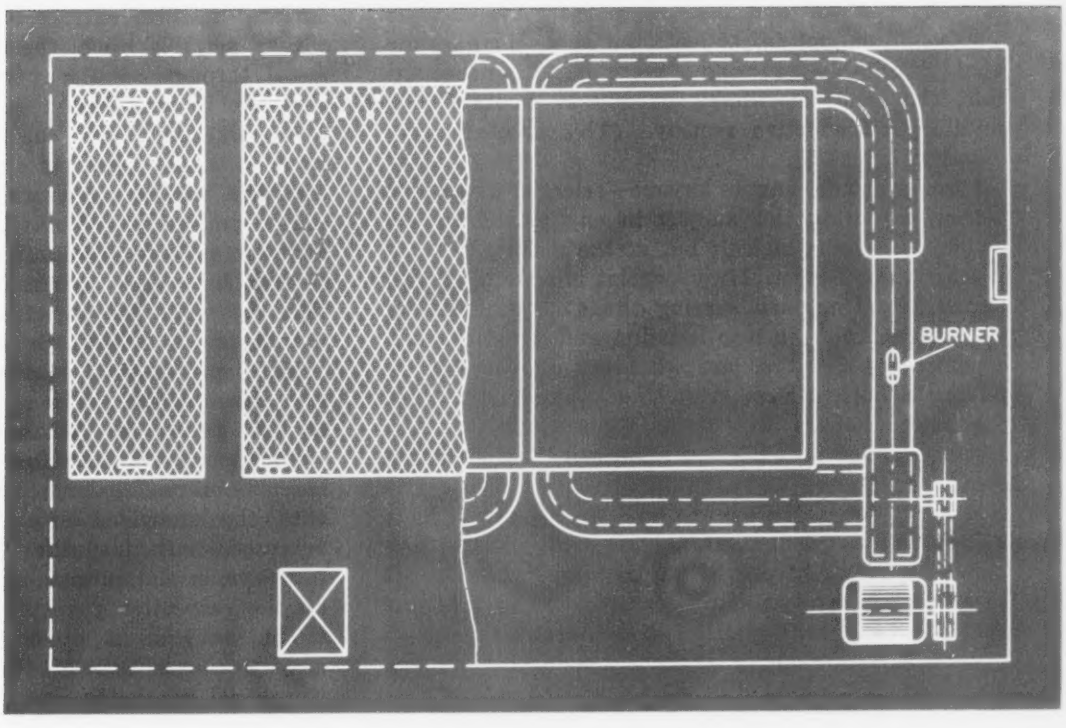


Fig. 8—Sketch showing details of the pit type core ovens

castings through small openings in the booth doors. A revolving table rotates slowly the car on which the castings are loaded. This car enters the booth over a track and is loaded and unloaded by a 10-ton overhead crane serving the cleaning department.

The foundry is a jobbing shop with a yearly production of about 1200 tons of finished castings. Most of the molding is done by hand. The present layout is not well adapted to machine molding, only a small amount of such work now being done. However, if an increase in this type of work should be needed, some kind of roller conveyors could be advantageously arranged across the molding bay near the molding machines.

By HAROLD E. HENDERSON
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Metal Penetration

The author directs attention to the lack of practical application of what investigations have been made into causes of metal penetration into the face of cores and molds. While offering no specific remedies for the problem, he indicates benefits derived from use of certain type sands

CONFESSION of ignorance is the beginning of wisdom!"—Anon. (It is also good for the soul.) Metal penetration into core and mold face has been investigated and discussed at great length by men of much and little foundry experience—and by men who admit to having no foundry experience whatever. Just how much dependable knowledge have we, on this very important subject?

In most iron jobbing shops, metal penetration occurs at infrequent and unaccountable intervals. Were this condition not infrequent, the shops in question would inevitably go broke. Were it not unaccountable, the condition would speedily be abolished by suitable and effective remedy. (This is elementary foundry logic.)

I would not discourage anyone—scientist or empiric—from exploring this subject in any manner which to him may seem logical; but at the outset, let's try at least to be honest. My viewpoint is admittedly empirical, as I am now serving the 41st year of my apprenticeship in an iron foundry, and am still somewhat confused as to just what my instructors are talking about. I have read lengthy and apparently exhaustive papers on "Metal Penetration" written, I presume, for presentation at meetings of foundrymen. These have undoubtedly served to arouse and excite interest in the subject, and to this extent have value; but to the best of my knowledge, they have had little effect in preventing metal penetration. If these authors are presenting information of practical value, and the rank and file of foundrymen make no use of it, something is definitely wrong! Have the authors failed in making their knowledge understandable; or is the reader incapable of comprehending the thoughts presented? I am asking the question, not answering it.

There is a gulf—which I hope will be bridged—between the man who has come up the hard way, making castings, and his scientific brother who labors in the laboratory. Each works in his own way, speaking a language peculiar to himself. Each has much to learn from the other, if he will only attempt to pierce the artificial barriers of experience and speech. Each, in his own way, is dedicated to the advancement of the casting industry.

Metal penetration, we are told, is that condition where molten metal is forced or drawn for a considerable distance into the interstices between the sand grains. It is sometimes confused with scab and burn-on, and has been so described by well meaning persons; but, in reality, it is something entirely different. It may and does occur on either core or mold surface. If these surfaces have been properly coated with a suitable wash, the objectionable extrusion of metal through sand may be easily removed with a chisel, or in some instances even by sliding the blade of a pocket-knife into the parting slit. It is not uncommon, upon removing a patch of this material, to find the underlying casting surface unaffected by the migration of metal. There is no evidence of adhesion visible to the eye; the coat of graphite would seem to have been undisturbed. This, despite the fact that the metal has penetrated as much as or more than a quarter of an inch of sand.

Metal penetration, as such, is most certainly not new either to the art or science of the casting industry. Its painful effect has been felt in the most sensitive spot known to a foundryman—his pocketbook! He has observed, examined and studied this "growth" with the undivided attention of a great surgeon microscopically inspecting cancerous tissue. Both foundryman and surgeon have been equally dismayed by the respective poverty of knowledge obtained.

This subject, as previously mentioned, has been aired to a considerable extent in speech, with printed word, and by sketch and photograph. Men of varying talents have attempted to clarify the subject, in the hope that a dependable remedy might be found. At times, it seemed as though success was assured. Predetermined methods of control on a given sand and metal apparently spelled victory—a victory which subsequently proved of dubious value. The results could not be duplicated!

In our own experience (a gray iron jobbing shop) over the years, we have witnessed the production of diesel cylinders (liners) with an absorbing curiosity.

After casting a hundred or more of these to our entire satisfaction (which is a modest way of saying that they were the world's best castings), we were suddenly confronted with the dismaying appearance of "penetration!" This condition, in varying degree, might appear in almost epidemic proportion; or, which was usually the case, at unexplainable intervals. Two molds, which to the best of our knowledge were made precisely alike, produced contrary results. One gave us the desired "peel" while the other revealed patches or streaks of penetration. In one instance only the core would be affected; in another, both core and mold carried the blight.

From superintendent to molder, opinions were freely expressed as to the probable cause and cure of this disease. These expressions were welcomed and each was sympathetically considered in the hope that a fruitful answer might be found. Coarse sand was replaced by one of a finer grain. Harder ramming was resorted to. Higher heat and added hours of oven-time were prescribed to counteract possible "greenness" and the possibility of exothermic reaction. (I borrowed that phrase from the laboratory.) The torching of mold and core just prior to pouring was suggested and tried. Gates were changed to reduce impingement; and metal temperatures were noted and checked against results. Graphite of higher quality failed to discourage this metallic curiosity. When three coats of wash were applied, each in turn of a slightly heavier baume, the problem appeared to be solved; but usually we had done so many things that we couldn't possibly point with assurance to the one measure responsible.

Must Find the Cause To Prescribe a Cure

About here, my academic brothers will smile with a withering contempt for all that is labeled "empirical," and I find myself somewhat inclined to agree with them. I have argued again and again that, until we are able to intentionally produce a defect, we shall not know how to prevent it. With this thought in mind, I have requested a series of experiments, each of which would have bearing on one suspected phase of the procedure, in the hope that we might find this "Ethiopian in the woodpile." To this, my revered and respected co-workers reply, "Dammit, you've got 57 explanations for metal penetration! We've got defense orders screaming at us! We can't afford to lose 56 castings just to make you happy!" To such barbaric reasoning, there is simply no fitting reply.

Among published papers on this subject, one in FOUNDRY, May, 1951, by S. L. Gertsman, physical metallurgist of Ottawa, Canada, is the most thorough and thought-provoking that I have read to date. Mr. Gertsman is to be congratulated on a job well done. He has presented a minute record of his test procedure, together with illustrated details of results. His summary is both brief and temperate. He indicates a "path" of procedure; but he warns that "none of these suggestions are *sure cures,* since the problem has not yet been overcome." He explains that the major part of his paper deals with work carried out on steel, although (*Please turn to page* 245)

Two views of a 7-ton gray iron casting for a steam turbine. Considerable metal penetration into cores was corrected when a coarser sand was substituted

Factors to be considered in the application of heads to steel castings are discussed in this third of a series of articles. Methods of keeping the head molten to promote efficient feeding of the casting also are described

Gates and Heads

FOR STEEL CASTINGS

By JOHN HOWE HALL
Consultant
Swarthmore, Pa.

IN COOLING from a temperature above its melting point to that of its surroundings, steel contracts to an extent shown graphically in Fig. 17, taken from Briggs[14]. The figures for contraction in the liquid state are not absolutely reliable, but it is safe to assume that for each 100° C that it cools, liquid steel contracts about 1.5 to 1.75 per cent of its volume at atmospheric temperature. In solidifying, there is a contraction of some 3.05 per cent of the volume at atmospheric temperature, and a further shrinkage of 7.2 per cent takes place as the solid metal cools to atmospheric temperature.

If a body of steel of any given shape could cool uniformly to its solidification point, with no temperature variation from surface to center, and then solidify at the same instant throughout its mass, it would be solid, since each layer would be free to contract, without hindrance from the layers within it. However, this is impossible, because the outer layers necessarily cool faster and solidify sooner than the inner portions of the mass.

Even before any solidification has taken place, the body of steel is somewhat cooler at the surface than at the center, and the outer layers solidify while the interior is still molten. If the metal could be held against the walls of a mold in an exceedingly thin layer, there would be nothing to hinder its contraction, both in solidifying and in further cooling, and it would shrink to the extent indicated by Fig. 17. However, as each successive layer must solidify around hotter, liquid metal within it, which has not yet contracted, the freezing layers are unable to contract freely, but must retain the dimensions imposed upon them by the incompressible fluid metal within.

When solid, therefore, they are longer and wider than they would have been had their solidification been unopposed. Similarly, as the outer layers continue to cool below their solidification temperature, their solid contraction is restrained by the hotter layers under them, which have not yet contracted as much as the outer layers would have, had they been free to contract unopposed. Since the strength of steel at temperatures just below its freezing point is exceedingly low, the outer layers as they cool yield and conform to the dimensions of the layers adjacent to them—in other words, they are longer than if they had been able to contract freely, or as Howe[15] expressed it, they have been "virtually expanded."

As solidification proceeds, the successive layers will become progressively too small to conform to the dimensions of the "virtually expanded" metal surrounding them, and the diminishing body of fluid steel will fail more and more to completely fill the space containing it. A cavity is thus formed within the

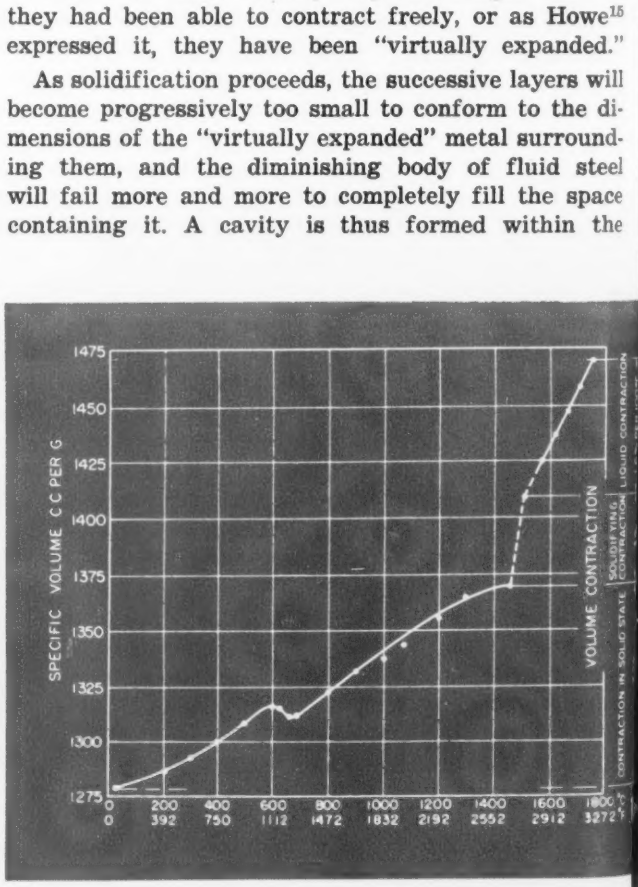


Fig. 17—Volume change recorded on cooling a 0.35 per cent carbon cast steel. Fig. 18—Cross-section-

partly solidified mass, which deepens and grows narrower until the last of the metal freezes. In an ingot, the cavity thus formed, which the rolling mill men calls a "pipe," has the familiar funnel-shaped outline shown in Fig. 18. Similarly shaped openings in castings or in the upper portions of sink-heads are known to the steel foundrymen as "shrinkage cavities."

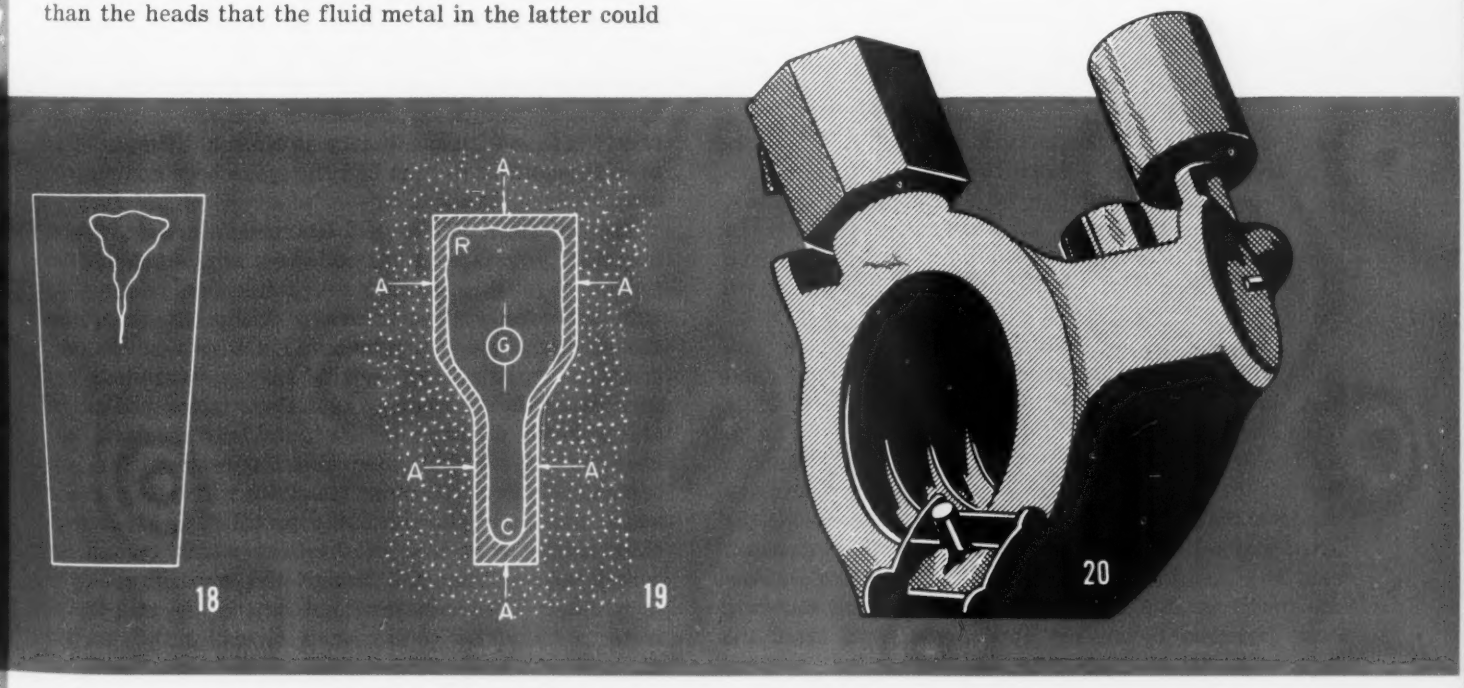
To secure perfectly solid steel castings, a source of fluid metal must be provided, so located that it will feed into the solidifying castings and keep the volume of the liquid metal within it large enough to fill the space between the solidified and virtually expanded outer layers so that no shrinkage cavity will be formed. As indicated at the beginning of this chapter, this is the function of what are known as "risers," "sinkheads," or simply "heads," which are set upon or against the casting in places so located as to provide fluid metal when and where it is required, and are removed from the casting after it has cooled. Suitably shaped extensions of the pattern, either integral with it or loose, are used to form the sink-heads.

In 1914, the oxy-gas cutting torch had not come into general use in steel foundries. Sink-heads, therefore, had to be cut off with slow-speed circular saws, knocked off with sledges or heavy "dollies," or removed with the mechanical sprue-cutters used to sever the gates of small castings. Whenever possible, the foundryman wished to knock them off, and therefore frequently attached them to the casting by means of long, thin necks that would readily break without taking pieces out of the castings. Fig. 20, from the author's book, *The Steel Foundry,* shows a typical case of this practice.

In his 1914 paper, already referred to, the author pointed out at some length that heads of this type, then all too commonly used, were largely ineffective because the necks would solidify so much earlier than the heads that the fluid metal in the latter could not possibly flow into the castings and thereby prevent the formation of cavities in them. In emphasizing the importance of making the necks of sink-heads very short, the author described the thin cores developed in 1908 by E. C. Washburn, for forming the shortest possible necks between sink-heads and the castings to which they were attached. When the necks are thus formed in thin cores, the heat of the steel in the castings and the heads so postpones the solidification of the necks that proper feeding of the castings is possible.

The author also stated that the best feed of all was obtained when the heads had no necks whatever, but were brought down full-size to the point where they joined the casting. Such heads, however, had to be removed with the cold saw, and often the casting could not be so set up that the saw would reach heads placed on sections where they were badly needed. Sometimes no heads at all were placed in such spots, sometimes quite useless long-necked ones that could be readily broken off were used. Washburn-type cores enabled the foundryman to set readily-broken, but effective, heads in these inaccessible places, and for some years they were so used.

The development of the oxy-gas cutting torch profoundly affected steel foundry practice, by making it possible to cut off neckless heads at almost any location on a casting, and to trim off extra metal added as "padding" to promote progressive solidification of the casting from the bottom upward. In a way, however, the cutting torch held back progress, since it discouraged the use of the Washburn head. At that time, it was so much cheaper to burn off neck-less heads than to make and set Washburn cores, that their use was for a number of years almost completely abandoned. Of late, however, the increase in costs of labor and materials has changed



al view of ingot showing general location and appearance of a pipe. Fig. 19—Shrinkage cavity formed when open head allowed to freeze. Fig. 20—Thin necks freeze quickly, shutting off metal from heads

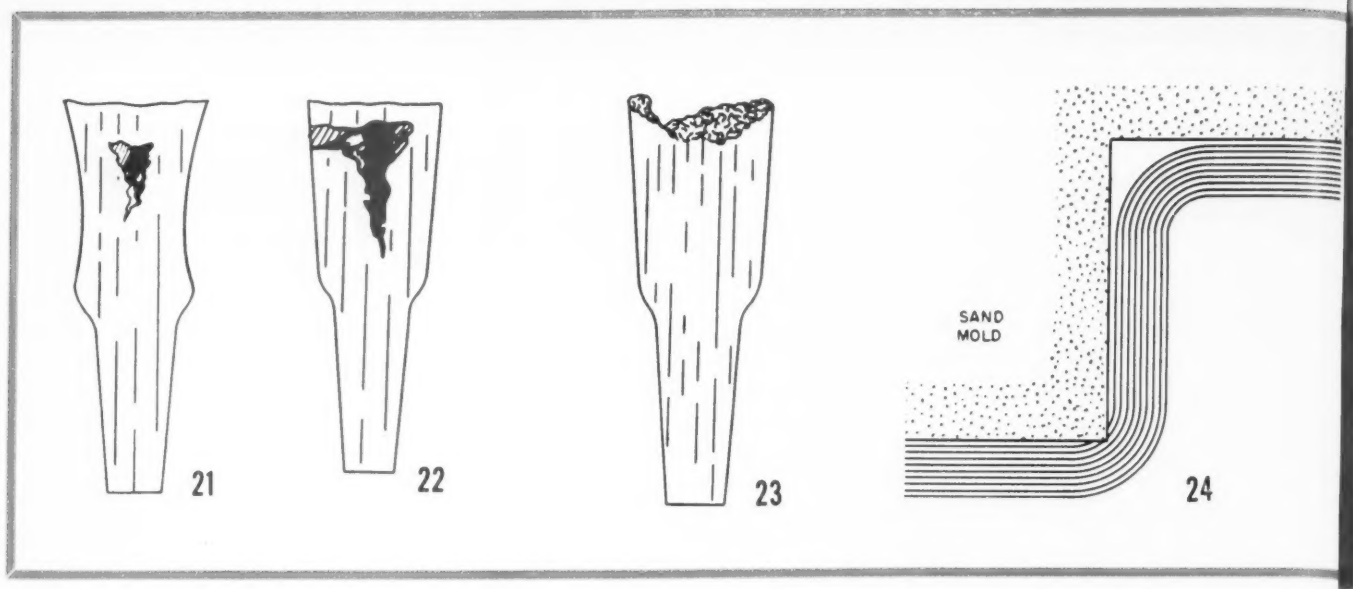


Fig. 21—Walls of the riser tend to collapse because of internal shrinkage, atmospheric pressure
Fig. 22—This riser was kept open to the atmosphere by application of side core near the top
Fig. 23—Similar type of riser as in previous

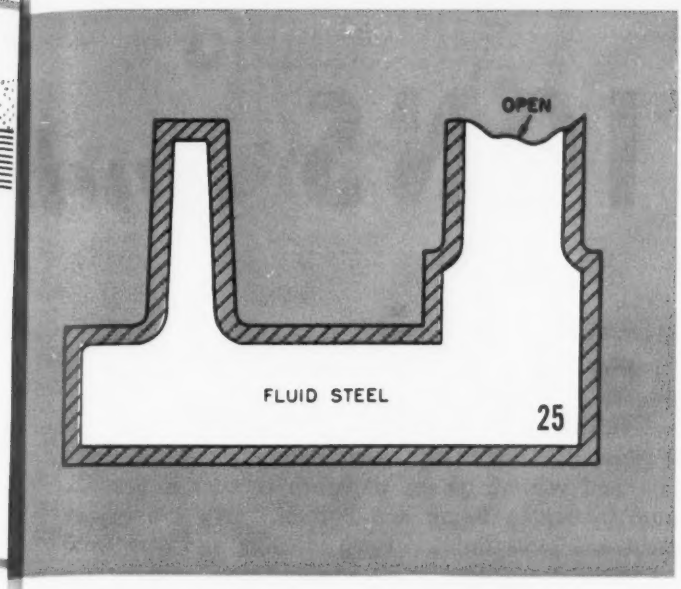
this situation, and the almost forgotten Washburn core and head have come back into general use. The Steel Founders Society of America, through the activities of its research and development committee, has taken a leading part in demonstrating the advantages of the Washburn head and core, and in determining the correct sizes and shapes of necks for any given head. This subject will be discussed in detail in later pages.

To be effective, sink-heads must remain molten longer than the portions of the castings they are intended to feed. They should, therefore, be of such size and shape that they will cool more slowly than the castings. As the rate at which a head cools varies directly with the ratio of its surface area to its volume, a spherical head, which has the smallest surface area per unit of volume would be the most effective. It would be possible, of course, to mold a spherical head, by making its lower portion in a core, but the cost of such a method would outweigh the possible benefit secured. A cylindrical head, however, or at least one of oval cross-section, has rather less surface area per unit of volume than one with rectangular cross section (and has no fast-cooling corners), and therefore should be used whenever possible. In some cases the lowest portion of the head may have to be flat-sided, but generally it is not difficult to make the greater part of it cylindrical.

Sink-heads are of two general types—open and blind. The former extend to the top of the cope sand and, as the name implies, are open to the air, while blind heads are formed in a closed space in the mold. As the steel loses heat to sand more slowly than to the air, it always seemed to the author that open heads should be tapered upward, so as to have the least exposed area, and thus cool at the minimum rate and remain molten as long as possible. To shape the heads in this way necessitates drawing separate head patterns downward out of the sand after the cope is lifted, instead of loosening them and pulling them up. For this reason the tapered head has never been used to any great extent, and today the wide adoption of pipe-eliminating compounds to postpone the freezing of open heads has made the tapered shape less advantageous than it was when nothing was done to keep the steel from solidifying quickly.

When an open head set upon a casting of smaller size than the head is allowed to freeze over completely, as illustrated in Fig. 19, from an article by Taylor & Rominski[17], a shrinkage cavity will be formed in it near the top, since the earlier solidification of the casting drains metal from the head. This cavity can be filled only by what gases may be evolved from the steel in solidifying, and therefore a partial vacuum is created in it. The pressure of the atmosphere outside the head then presses in its walls, which are still hot and weak, and thus somewhat reduces the volume of the space within the solidified outer crust. The shrinkage cavity is thus a little smaller than it would have been had the walls been completely unyielding.

Fig. 21, from Taylor and Rominski's article, shows a casting whose head has collapsed at the top and on the sides in this manner. A companion casting, in which a core set near the top of the head permits the access of air to its interior, is shown in Fig. 22, from the same source. In this case, a vacuum is not formed inside the head, so that there is no unbalanced atmospheric pressure on its outside walls, and the head is left straight-sided and flat-topped. The difference in volume between the space within the frozen walls and the metal available to fill it is greater in this case than in that of the head which froze over completely, so that the size of the shrinkage cavity is greater. The pressure put upon the still-liquid metal within the solid-topped head by the partial collapse of the lower portions of its walls, tends to counteract the effect of gravity to a slight extent, and thus the head with completely solid walls probably feeds the casting a little less efficiently than the one provided with a core to admit atmospheric pres-



figures except that a pipe eliminator was used

Fig. 24—Isotherms at an outside corner and at a re-entrant angle in a solidifying casting

Fig. 25—With heads of different size, the smaller freezes first, prevents feeding section below

sure to its inside. But as there is no way in which atmospheric pressure can act directly upon the fluid metal and hold it up, the formation of a vacuum in the shrinkage cavity in the head in no way interferes with the flow of metal by gravity from the head to the casting.

In a great many cases, the pressure of the outside air is sufficient to rupture the top of a solidifying head at one or more points, the resulting holes in the frozen skin performing the same function as the core used in the example shown in Fig. 22. If the heads have been filled with steel at or near its melting point, however, so that a heavy top skin is formed as soon as pouring is stopped, no opening will form, and the conditions within the head are those illustrated by Fig. 21.

Sometimes the exterior atmospheric pressure, instead of puncturing the top of the head, will crush in and puncture some spot on the walls of the casting. This is especially apt to occur at a re-entrant angle in the piece, where the steel solidifies more slowly than at other places on its surface. The sand at the re-entrant angle is not able to extract heat from the metal as fast as that on the plain surfaces, as illustrated in Fig. 24, taken from Briggs[18], so that at any given moment during solidification the frozen skin is thinner at these points than on the rest of the casting. Cavities thus formed at re-entrant angles, as noted by various authors, are often mistaken for hot tears or other types of defect in the casting.

The most important effect of such a puncture of the walls of a casting, however, is that it may admit atmospheric pressure to the still molten interior of the piece, and thus prevent a head that has frozen over solidly from feeding as efficiently as it should. Under these circumstances atmospheric pressure acting upon the molten metal within the casting and head tends to force it upward against gravity, as mercury is held up in the tube of a barometer, so that the head does not feed. Since perforations of the casting skin are always likely to occur, heads set upon the top of a casting had best either be provided with atmospheric pressure cores, or be kept open to the air by some other means, such as the use of pipe eliminators.

Unless the skin of the casting is punctured in this way, however, the admission of atmospheric pressure by means of a core, to the interior of a *single* open head set on top of a casting, is of relatively minor importance as far as the feeding efficiency of the riser is concerned. What is important is that the head as a whole should solidify so much more slowly than the casting on which it is set that the largest possible volume of liquid metal will be available in its interior until the casting has completely solidified.

To accomplish this result, steel foundrymen have for years covered the sink heads on large castings with coke breeze, lump charcoal or some other material whose combination retards the cooling and solidification of the steel. In certain cases, oil or gas torches have been used to reinforce the action of the charcoal, and in at least one foundry, 50 per cent ferrosilicon was fed into the top of certain large heads and a blast of compressed air directed upon the liquid metal. The head then became a small side-blown converter, and the heat of combustion of the silicon, manganese and iron kept the metal fluid for a considerable time. This practice, though effective, was discontinued because occasionally some of the high silicon metal from the top of the head fed down into the casting itself.

Some concerns making very large rolls and other castings even keep the tops of the heads liquid by setting a brick-lined cover on them, which is provided with three electrodes, connected to a suitable source of high-amperage, low-voltage current. The top of the head thus becomes in effect a small electric furnace, and the steel in it can be kept fluid for a very long time.

In pouring small castings the usual procedure, before the introduction of the so-called pipe eliminators, was simply to shovel a little dry sand from the foundry floor on top of the heads. This was done chiefly to protect the men handling the ladle from the heat of the steel, though the fine dry sand to some extent blanketed in the heat of the metal, so that the heads froze a little more slowly than if they had been left bare. The author at one time used the flour-fine powdered slag from a basic electric furnace instead of dry sand for this purpose, and found it fairly effective in postponing the solidification of the heads.

For the past 15 years or more, however, the use of "pipe eliminators" of one sort or another has been standard practice in steel foundries making both small and large castings. In a way, the term "pipe eliminator" is a misnomer, since what these substances do is to so slow up the solidification of the heads that they will be thoroughly drained of their fluid contents by the demand of the casting for feed metal, and thus will "pipe" deeply. That is, pipe eliminators eliminate pipes and shrinkage cavities in castings by promoting (*Please turn to page* 237)

QUESTIONS and A

Plaster Molding Composition

Q.—In one of the issues of FOUNDRY early this year we saw an article on plaster molding, and will appreciate further information on the components of the plaster as well as the amount of water used.

A.—Plaster of paris or gypsum compositions used as a mold material for production of metal castings is more commonly known as "metal casting plaster." It is composed of gypsum and fibrous talc or steatite (agalite) in the ratio of 4 lb gypsum and 1 lb talc. Materials are mixed dry if obtained separately, but can be obtained already mixed.

Liquid plaster used in forming the molds is made by adding the dry mix to preferably warm water in the ratio of 1 lb plaster to 1.4 to 1.7 lb water depending on the desired consistency. The mix is stirred until it starts to "cream" or thicken and then poured into the flask or container. Material is allowed to air-set 15 to 30 minutes, removed from the pattern, and then dried in an oven. Time required will depend upon the temperature and ranges from 1½ to 18 hr with temperatures from 1450 to 400°F.

Blames Gas Holes on the Metal

Q.—For lack of pig iron we have been compelled to use all scrap in the cupola charge. The resulting castings show a great many gas holes, especially on the cope side. We have been informed that a number of ingredients are available for incorporating in the cupola charge to prevent the formation of these gas holes. We shall appreciate your opinion on the subject.

A.—Composition of the iron is not a factor in the diagnosis of a casting condemned on account of gas holes. Perfectly satisfactory castings are made from all-scrap cupola charges. In some instances it is necessary to add a small amount of one or more alloys where the castings must conform to definite chemical or physical specifications. You can obtain full instructions from producers of these materials whose names and addresses appear regularly in the advertising pages of FOUNDRY.

Gas holes in castings result from faulty melting or molding practice. With a low bed and high blast, some of the iron in the cupola becomes oxidized or, in plain English, burned. The initial coke bed may be too low, or gradually becomes burned away because the iron charges are too heavy, or the coke splits are too light, or both. In some instances the iron is melted properly but is contaminated with steam while in contact with a hard or wet bottom, while flowing through a wet spout, or while standing in a ladle in which the lining is not thoroughly dried.

Steam from a hard, wet or improperly vented mold or core will produce gas holes in a casting. In the present instance we suggest you reduce the weight of each metal charge. Also reduce the blast pressure and volume. Keep moisture content to a minimum in cupola lining and bottom. Dry the cupola spout and ladle lining. Keep molding and core sand in proper condition. In claiming that satisfactory castings may be made from scrap charges, it is obvious that a certain amount of discrimination is necessary in making up the charge. One hardly would expect to pour soft, machinable ¼-in. section castings from a cupola mixture containing steel and malleable railroad scrap, burned grate bars and brake shoes.

Core Uniformity Not Obtained

Q.—In our foundry located in New Zealand we are having considerable trouble with cores, and would like to have a good formula for them. We use core gum, and some of the cores are hard and some are soft. Sand generally is sweepings from the rumbler, and we believe a good beach or river sand would be better. Also what results are obtained using copper as a flux for a type metal pot? We say dry the mold and use good hot metal.

A.—While we agree that it would be much better practice to use a good beach or river sand for making your cores, we believe that your present trouble with hard and soft cores probably is due to lack of proper mixing of binder with the sand so that the grains are uniformly coated, and to nonuniform baking. Proper coating of the sand grains with binder can be determined experimentally by varying the mixing time until the best results are obtained, and then seeing that each batch is mixed exactly the same length of time. The same can be done with baking time.

Possibly the oven may not heat uniformly. If you do not have thermocouples to place in various areas in the oven, you can place similar cores in various locations and find out what happens. It hardly seems necessary to point out that heavy and light section cores should not be baked together unless the latter can be removed when they are baked without interfering with the heavier ones.

We hardly think that the term "flux" can be applied to copper since it definitely is an alloying agent which affects the matrix of gray iron by reducing excessive free carbide and refining the pearlite structure, and thereby its physical properties. Presumably in the case of the type metal pot which has to

Answers

resist heat, the iron also contains some chromium, and the copper is employed to modify its carbide stabilizing effect.

Drying the mold and using good hot iron for pouring the pot are not necessarily the essentials in making a suitable product. For example, with skill and experience it is possible to make a good-size pot in green sand, and we gather that such practice is employed in your foundry for some. Likewise, unless the composition of the iron is suitable for the service the pot must meet, its temperature will be of little import except from the viewpoint of obtaining a sound casting.

Alloy Has Peculiar Appearance

Q.—Under separate cover we are forwarding to you the top of an aluminum alloy sprue which illustrates some difficulty we are having. The castings are made of primary No. 43 ingot, and exhibit the same mottled surface appearance as on the sprue. Same results are obtained whether the castings are made in dry sand, green sand or a combination of the two. Mottling appears on edges, tops and bottoms, and is more prominent where gates and risers are attached. Coke-fired furnaces are used, and pouring temperatures from 1200 to 1300° have been used.

A.—Examination of the mottled sample indicates that the dull spots are rougher than the bright spots, and exhibit more distinctly shaped dendrite tips exposed to the surface. Metallographic examination of the specimen indicates that the dull and rougher zones were adjacent to metal which appeared to be unsatisfactorily modified in comparison to the metal next to the smoother patches on the surface.

We believe that this difficulty can be overcome by addition of metallic sodium to provide satisfactory and uniform modification. Amount of metallic sodium should be on the order of 0.01 to 0.05 per cent as normally only a small portion of the addition is recovered in the melt, and just a few thousandths of a per cent are needed for the desired modification.

Thin Castings Cause Trouble

Q.—We are producing malleable iron in a powdered coal-fired furnace with a capacity of 15 tons in which our heats run from 5 to 14 tons, averaging 9 tons. Heats are calculated by correct metallurgical procedure to meet ASTM specification 35018 for railroad castings, but we also produce many thin-section non-railroad castings. Foundry is equipped with 600-lb bull ladles, but due to distance to be carried, pouring time, and section thickness of castings, we find it necessary to have the temperature of the iron at 2860°F or above. We have tried varying the method of arranging the charges as well as their composition, but we have considerable difficulty in obtaining high temperature. We are enclosing a sketch of the furnace with some data on coal and air feed. We are using 1100 lb of coal per ton of iron—which is high.

A.—As you already have realized, there is considerable disadvantage in trying to pour small castings from the railway specification, and perhaps underestimate the difficulties due merely to thin sections in any iron. You do not mention how thin the sections are, and perhaps the 600-lb ladle takes so long to pour thin-section castings that the last iron is cold. There is such a thing as considering a balance between the lessened heat loss per unit weight of metal from a big ladle and the increased time required while emptying the ladle of the larger size.

It does not seem to us to be good practice to make heats varying from 5 to 14 tons in the same furnace. If the furnace is right for 9 tons, it should not work well at either 5 or 14 tons. Perhaps your trouble is lack of circulation in the bath, and again maybe the trouble—since it is variable—is due to oxidation in the furnace. We are inclined to think of the latter subject because you mention that the combustibles passing the bridge are low. If that means that they are low in carbon monoxide and high in carbon dioxide, there may be flame compositions which are oxidizing the metal itself.

We hope that you realize the uncertainty of taking radiation pyrometer readings on relatively small streams flowing in open air and perhaps in smoky atmospheres. You should be able to tell by looking in the furnace whether the bath is circulating, and

GANGWAY!

By J. A. PATTERSON

"Migosh, she forgot her rubbers!"

QUESTIONS *and Answers*

should be able to see whether energetic rabbling would help the furnace heat up. If it does, the circulation is likely to be poor. We make no claims for correctness for any of these statements, but offer them merely as suggestions for further thinking. Naturally, such difficulties are best overcome by having an experienced melter watch the operations.

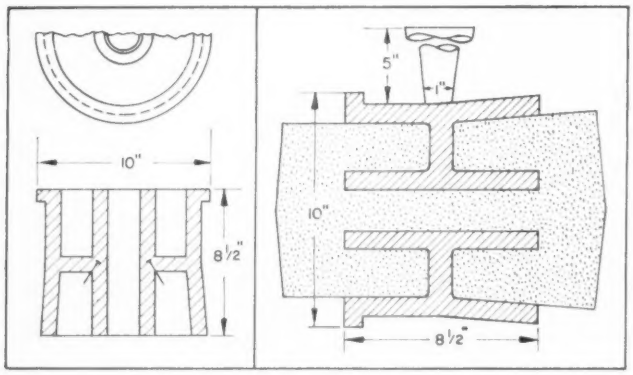
Cast Drum in Horizontal Mold

Q.—We are having considerable trouble producing the cast iron drum shown in the accompanying sketch. We have made it with and without the center core, but the metal in the bore is porous in the vicinity of the central web. We shall appreciate any suggestion that will enable us to produce castings solid in the bore.

A.—We would be in better position to offer suggestion, if you had supplied detail of present molding and casting process. We assume that the mold is made in a dry sand core assembly, in a vertical position, and poured through a pop gate on the hub. Concentration of dry sand cores keeps the temperature high in the center. The rim sets first and draws metal from the liquid metal in the hub. Later when the metal in the hub needs metal to compensate for the loss, the small pop gate has solidified and no more metal is available.

Two remedial measures are available without changing present pattern, mold and cores. 1—Enlarge the sprue on the hub so that it also will serve as a feeder. 2—Stick a row of wire nails (Fig. 1) in the inside top of the lower chamber core with the heads projecting into the web space and within ¼ in. of the center core. The nails will chill the metal in this area and equalize the cooling rate between the hub and the rim. Small cast iron chills incorporated in the chamber cores will serve the same purpose.

If the size of the order warrants the expense, we suggest a new pattern split horizontally along the center line of the bore. With suitable flasks one half pattern would be sufficient mounted on a board for use on the floor or on a molding machine. The outside of the mold then could be made in green sand with the exception of a small ring core (not shown on sketch) to form the worm teeth. The chamber cores and the hub core could be made as a unit—that is, two half cores made in the corebox and then pasted together. A tapered sprue, 1 in. diam at the lower end, is set on the pattern directly over the web. This will serve as sprue and feeder.



(Left)—Gray iron drum casting molded on end. (Right)—Same casting molded horizontally

Pour Two Molds at Same Time

Q.—We would like to know if any foundry now or in the past used a multiple spout ladle for pouring two or more molds at the same time. We are considering such a procedure for two molds. Metal is soft gray iron with castings weighing about 4 lb and ⅛-in. section. Molds are set on floor in rows of 10 each and mold height above the floor is about 12 in. It is realized that in such a method mold spacing and sprue location must be exact. Do you think it can be done?

A.—It is reported that Arthur Brisbane once stated that "man can accomplish anything he can imagine," so from that premise all that is necessary is working out the details. As you point out, mold and sprue locations would have to be maintained within certain tolerances based on the spacing of the ladle spouts, but that should not be too difficult. Use of suitable stops at side and end for each mold along the pouring rack will provide proper location while placing a boss on the pattern to indicate where the sprue is to be cut will take care of that part.

Use of the multiple-lip ladle is not new. It is employed in pouring soil pipe and for 16-ft lengths of water pipe cast horizontally, so it appears reasonable that it could be used for pouring several molds provided the sprues can be lined up properly. Whether that arrangement would have any advantages over single pouring would have to be determined by practical experiment—keeping account of all the cost factors involved.

Desires Open Structure Iron

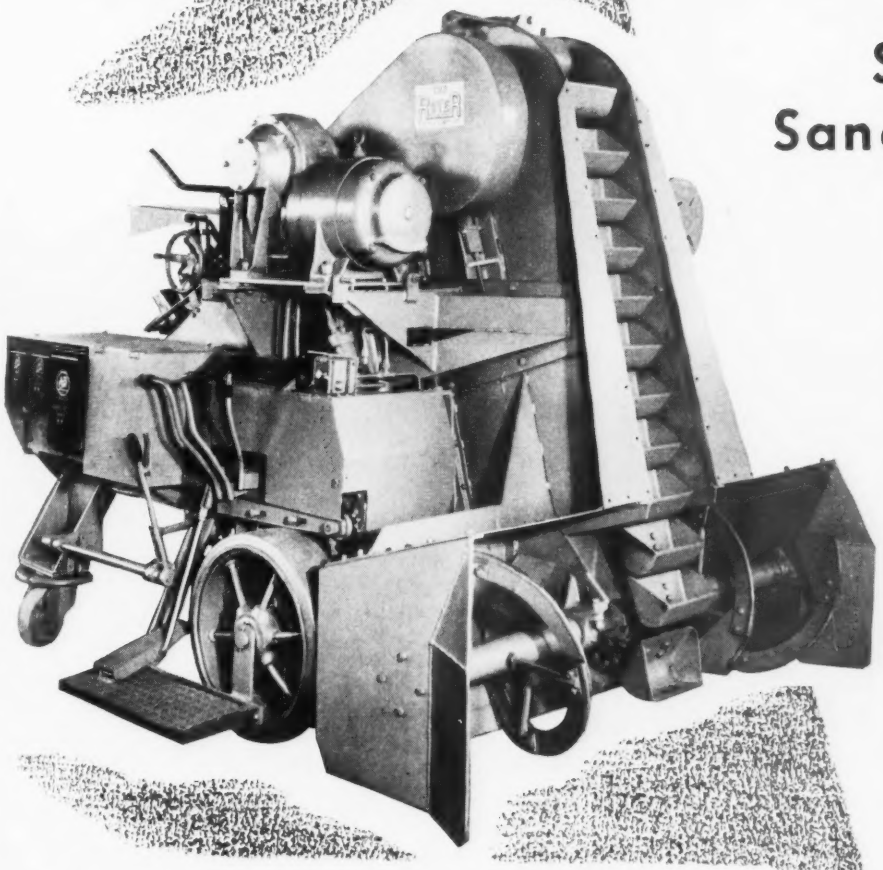
Q.—We have been asked to make a few castings for lapping bearings of precision instruments. These castings are about 2 in. in diam and ½-in. thick, concaved to about ¼-in. at the center. The catch on the job is that the iron should be open enough to hold the rouge in the pores of the metal. Our regular iron mix is made up of 200 lb pig with 1.98 per cent Si, 0.26 per cent P, and 1.66 per cent Mn; 200 lb purchased scrap; 100 lb remelt, and two silicon briquets containing 1 lb Si each. We have various alloys for ladle additions.

A.—From the information you give relative to the components of your present charges, we estimate that your present iron from the cupola spout contains about 2.20 per cent Si, which will result in a dense structure, and that is borne out by your remark about obtaining an open structure iron. While you do not mention it, we gather that you only have a small

(*Concluded on page* 110)

completely mechanized *sand preparation*

with the new ROYER Self Loading Self Propelled Sand Conditioner



This new hydraulically powered Royer Model RPL-R Sand Conditioner gives you completely mechanized sand preparation. Moving into the sand heap under its own power, it scoops up, completely conditions and discharges from 40 to 60 tons of fluffy, trash free molding sand per hour. In one complete operation the sand is thoroughly mixed, blended and aerated . . . **magnetic separation** removes all tramp iron and small scrap.

Time-consuming, back-breaking labor is entirely eliminated with a consequent saving in labor costs . . . and the properly prepared sand helps to make true-to-pattern molds, greatly reducing rejects and cleaning and grinding time.

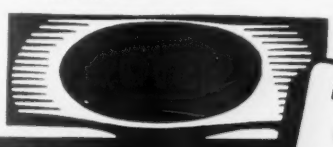
You will profit with a Royer —write for further information on this self loading, self propelled model.

NEW MODEL RPL-R FEATURES . . . . .

1. HYDRAULIC PROPULSION . . . Propelled by a hydraulic system, it has a wide range of variable speeds to 100' per minute and is protected against shock or overload.

2. MAGNETIC SEPARATION . . . Sand is conveyed over a magnetic pulley where all small scrap, shot, fines and tramp iron are removed. This additional magnetic separation assures you of molding sand free of all contamination.

3. CAPACITY . . . 40 to 60 tons of sand per hour can be properly and thoroughly conditioned.



FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

QUESTIONS *and Answers*

(*Concluded from page* 108)

quantity of the lapping disks to make at any given time—that is, not enough to warrant changing the composition of one complete charge of iron into the cupola. If that could be done, we believe that a Si content of about 2.75 per cent in the disks would provide an open grain. This could be accomplished by increasing the number of silicon briquets from two to five.

This suggestion might indicate that, if only a silicon increase is necessary, it could be accomplished in the ladle as well. However, late silicon addition or inoculation does not function in the same manner as when added in the cupola; the tendency is to improve the structure and mechanical properties rather than to impair them as we are trying to do. Possibly the addition of an excess of ferrosilicon or other graphitizing inoculants might produce the desired coarse, open structure, and it would be worth a trial. We suggest that you try the addition of 1 lb 80 per cent ferrosilicon or its equivalent in some other agent per 100 lb of iron, and be sure that it dissolves completely.

Another procedure which might accomplish the desired effect is to heat the castings in a furnace to around 1500°F and hold at that temperature for ½-hour, and then allow them to cool slowly in the furnace. This treatment should result in extensive decomposition of the pearlite, with production of ferrite and consequent softening.

Casting Beryllium Bronze

Q.—We would like information on suitable bronze alloys for making "powder funnels" used in the explosives industry. These weigh about 3 lb and, of course, should be spark-free. We have on hand a considerable number of scrap funnels which are supposed to be machined from solid bar stock beryllium bronze. Can you give us information on melting and casting new ingot as well as the scrap now on hand? What is used as the deoxidizer, the best melting and casting temperature, and should it be melted under glass, etc?

A.—We believe that the consumer of the "powder funnels" would be in a much better position to suggest suitable alloys than we are, but it would appear from your mention of scrap beryllium bronze, that it is a preferred material. Beryllium bronze is a generic term, rather than a specific alloy, and to use the scrap you now have on hand, it is advisable to melt it down and pour into ingots. Then the ingots should be analyzed to determine the beryllium content, and perhaps cobalt and nickel. Beryllium bronzes are said to have good corrosion resistance, and can be heat treated to improve physical properties.

Alloy preferably is melted in silicon carbide crucibles, and the loss in beryllium content runs about 0.10 per cent. As a general rule a certain amount of purchased ingot is used with scrap to maintain the beryllium content since the purchased ingot contains sufficient excess of that element to take care of melting loss. It is said that by first melting the scrap and then adding the purchased ingot, beryllium losses are held to a minimum. Charges should be melted as rapidly as possible to minimize gas absorption and beryllium loss, and stirring should be avoided. Beryllium is a deoxidizer so no other is required. Fluxes or slag covers are said not to be necessary, but *dry* charcoal cover is recommended. Pouring temperatures vary with the particular alloy, and range from 1850 to 2200°F.

For a more extended description of beryllium-copper alloys, and their handling, we suggest study of the article "Beryllium Copper Sand Castings" by John T. Richards, published in the August, 1951 issue of FOUNDRY.

Melting with Bituminous Coal

Q.—Have you had, or have you read of any instance where bituminous coal was used as a fuel for melting iron in the cupola.

A.—We have had no personal experience with the use of bituminous coal as cupola fuel, but we have read of instances in the past where it was claimed the coal was used satisfactorily. For example, the following report written by John M. Dietz was presented in the February, 1917 issue of FOUNDRY.

Operation of a foundry out here in Nevada, far from the base of raw material supply, is beset with many difficulties. Recently when the coke shortage became acute, we were confronted with the problem of shutting down in spite of the heavy demand for castings, or resort to some fuel other than coke to melt the iron in the cupola. We had several tons of bituminous coal shipped from the neighboring smelter. Metal from the first trial heat was poured into molds for hard iron mill liners. The result was so satisfactory we determined to make regular heats and pour the general run of castings from iron melted with coal.

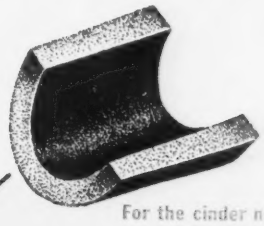
The cupola is lined to 34 in. and operated with a blast pressure of 12 oz. The bed consisted of 250 lb gas-house coke and 400 lb coal. The first charge, all scrap, was 800 lb. Each of the succeeding four charges was made up of 600 lb scrap and 300 lb coal. Total heat was 3200 lb scrap metal and 1850 lb coal and coke. This is a very high ratio of fuel to metal as compared to the usual 1 coke to 10 iron, but the result was satisfactory. The fire was lighted at 11 a.m. The iron was charged at noon. The blast was put on at 12:30 and the bottom was dropped at 3 p.m. The drop was clean with practically no slag. On the second day we ran off a heat of 4400 lb iron with 2525 lb coal. On this and other heats afterward the iron charges were increased to 325 lb. We demonstrated, at least to our own satisfaction, that in a pinch, bituminous coal will melt iron in the cupola.

This does not furnish a complete answer since coal formed only part of the bed charge. The problem is in the same class as the oil-fired cupola where coke also is required in the bed and part of the charge.

WHEREVER THE HOT STUFF HITS

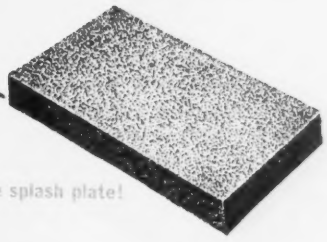
USE NATIONAL CARBON

TRADE-MARK



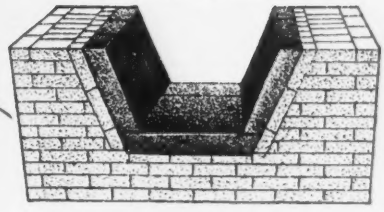
For the cinder notch liner!

For the cinder notch plug!

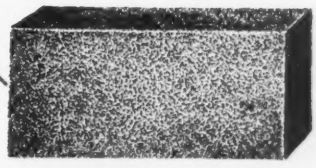


For the splash plate!

For the runout troughs!



For the skimmer plate!



● "National" carbon is now firmly established for blast furnace linings. It is being used outside the furnace as well—wherever there is contact with molten material—for the splash plate, runout troughs—clear down to the ladle—skimmer plate, cinder notch liner and cinder notch plug.

The reasons?

"National" carbon has no melting point. It is highly resistant to slag attack and thermal shock . . . not wet by molten metal . . . has a low thermal expansion . . . and maintains its mechanical strength at elevated temperatures.

Use "National" carbon inside and outside your blast furnaces and you cut down maintenance, speed up production and save money. For more information, write to National Carbon Company, Dept. F.

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

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IN CANADA: National Carbon Limited
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MEN

of Industry

HORACE M. BRINGHURST, Detroit director, foundry coke sales Semet-Solvay Division Allied Chemical & Dye Corp., New York, has been appointed assistant director of the Coke Division, Defense Solid Fuels Administration, as reported here briefly last month in "Late Foundry News." Mr. Bringhurst, who was graduated from University of Washington, was engaged in design and construction engineering until 1933, when he joined Semet-Solvay Division. He was Cleveland and Detroit area salesman, an expediter of coke oven construction, and district sales manager in the Detroit area before directing coke sales there.

♦ ♦ ♦

Comdr. Richard Doughton Jr., recently in the Office of Naval Material, Navy Department, Washington, has been returned to inactive duty as a member of the naval reserve and has accepted an interim appointment to the Metallurgical Advisory Board, National Academy of Sciences, Washington. With the board he is directly concerned with development of a nickel conservation program. During World War II Comdr. Doughton was in the Forging and Castings Section, Bureau of Ships, and later engineer officer on a Navy cruiser. He was on special assignments as management consultant in the specialty alloy foundry of General Electric Co., Schenectady, N. Y., when recalled to active Navy duty in 1948.

♦ ♦ ♦

James F. Pace has been appointed director of sales, Core Oil Division, the United Oil Mfg. Co., Erie, Pa. Mr. Pace joined the company in 1936 and has served as special representative, oil technician and more recently as assistant to the president.

Robert E. Kennedy, recently an instructor, has been appointed an assistant professor of the University of Illinois' Chicago Undergraduate Division, serving under Fred W. Trezise, associate dean of the College of Engineering. He continues in charge of foundry and pattern shop instruction, in which capacity he has served since 1946. A graduate of the University of Illinois, Urbana, Ill., Mr. Kennedy was a member of the faculty there for a number of years prior to his long association with the staff of the American Foundrymen's Society, starting in 1921.

♦ ♦ ♦

Newlin T. Booth Jr. has been elected president, Deemer Steel Casting Co., New Castle, Del., succeeding his father, the late Newlin T. Booth. With the company since 1940, Newlin T. Booth Jr. has served as production manager, and for the past 3 years as sales manager. He has been a director 2 years. Other officers recently elected are: **Mrs. Newlin T. Booth Sr.,** vice president; **George B. Harvey,** secretary; and **Jacob H. Speicher,** treasurer.

♦ ♦ ♦

W. J. Langston, since 1942 president-general manager, Canada Iron Foundries Ltd., Montreal, has been appointed chairman of the board of directors. **T. F. Rahilly** has succeeded Mr. Langston as president.

♦ ♦ ♦

Joseph H. Humberstone has been elected a vice president of Air Reduction Co., New York. **Scott D. Baumer** has succeeded Mr. Humberstone as president of the company's Equipment Manufacturing Division.

♦ ♦ ♦

John J. Walsch has been appointed foundry specialist with 5th Army Ordnance to cover inspection of ferrous and nonferrous castings in the Wisconsin area, with headquarters in Waukesha, Wis. Mr. Walsch was for-

(*Continued on page* 114)

HORACE M. BRINGHURST
. . . to Washington

COMDR. RICHARD DOUGHTON
. . . with Advisory Board

JAMES F. PACE
. . . director, core oil sales

ROBERT E. KENNEDY
. . . assist. prof., U. of I.

Woodward's New Blast Furnace

IN order to give still better service to its customers, Woodward has recently constructed and put into operation a new and modern blast furnace.

Completion of this new unit marks an important step in Woodward's present program of expansion designed to keep pace with the rapidly accelerating industrialization of the Southeast.

Merchant iron now being produced by this furnace is of the same high quality and aniformity for which Woodward's output is so widely known.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1882

GENERAL SALES OFFICE: 1515 First National Building • Birmingham, Alabama • Phone 54-1667

MEN *of Industry*

(*Continued from page* 112)

merly general foundry superintendent at Donovan Inc., St. Paul, and Kelsey-Hayes Wheel Co., Detroit.

♦ ♦ ♦

Roger A. Kenman has been named sales manager of the Machine Tool Division, Charles H. Besly & Co., Beloit, Wis., maker of grinding equipment and abrasive wheels. Mr. Kenman will have charge of the sales organization, personnel and policies affecting the division.

♦ ♦ ♦

Charles J. Paumier, formerly associated with Revere Copper & Brass Inc., New York, has been appointed Pacific Coast representative, the Electric Furnace Co., Salem, O., with headquarters in Los Angeles, where he will handle the company's line of heat treating furnaces and mechanized material handling equipment in California, Washington, Oregon and bordering states.

♦ ♦ ♦

R. E. Dickison, chairman of the Central Illinois Chapter of the American Foundrymen's Society for 1951-52, is assistant manager, Brass Foundry Co., Peoria, Ill., maker of brass and aluminum castings, production machine work and wood and metal patterns. Mr. Dickson has been associated with the company for 15 years. He was secretary-treasurer of the Central Illinois Chapter in 1949-50 and served as its vice chairman last year.

♦ ♦ ♦

William J. Brinkworth has been appointed representative, distributor sales, southwestern division, Link-Belt Co., Chicago, with headquarters at the Houston, Tex., plant. Mr. Brinkworth has been field manager, oil field distributor sales, and continues in this capacity, also supervising sales through the company's industrial distributors in the southwestern division. He joined the Ewart plant, Indianapolis, in 1929, spent 5 years in the malleable foundry, later was engaged in malleable sales and contacts, and transferred to Houston in 1946.

♦ ♦ ♦

L. D. Reed, for many years a sales engineer in the Chicago office, Whiting Corp., Harvey, Ill., has retired, following 36 years with the company. Mr. Reed has been in the company's sales department since 1922. He organized the Whiting sales office in Philadelphia in 1941 and during the war was engaged in special engineering work at the main office in Harvey, Ill.

♦ ♦ ♦

S. J. Jazwinski, for the past year senior staff engineer, metallurgical department, Ford Motor Co., Dearborn, Mich., has been appointed chief metallurgist, Central Iron & Steel Co., Phoenix Iron & Steel Co. and Chester Iron Co., subsidiaries of Barium Steel Corp., New York, with headquarters at Central Iron & Steel Co., Harrisburg, Pa. Mr. Jazwinski was associated with Barium Steel Corp. as chief metallurgist and vice president of two of its subsidiaries from 1946 to 1949, when he went to South America as a consultant.

♦ ♦ ♦

D. F. McMahon, formerly president, has been elected chairman of the board of directors, Quigley Co., New York, maker of refractory and insulating products. **J. A. Mulcahy** succeeds **Mr. McMahon** as president and will continue as treasurer. **G. B. Quigley** has been named secretary, and **R. J. Demaison** vice president, in addition to his duties as technical director. Other officers are **S. F. Murphy Jr.,** first vice president-sales, and **H. T. Thayer,** vice president and chief engineer.

♦ ♦ ♦

James A. Miller has been named manager of the Los Angeles sales and engineering office recently opened by Reeves Pulley Co., Columbus, Ind. Mr. Miller was previously associated with Bryon-Jackson Co., Los Angeles. **Harlan M. Gillis** will assist Mr. Miller in the new office. Mr. Gillis was in the company's New England office for 7 years and for the past 6 months has been in the home office in Columbus.

♦ ♦ ♦

Wesley S. Walker, product manager for nitrogen, Linde Air Products Co., New York, has been granted leave to act as director of the General Industrial Equipment Division, National Production Authority, succeeding **Walter E. Schirmer,** who has returned to his position as vice president, Clark Equipment Co., Buchanan, Mich.

♦ ♦ ♦

Boyd E. Cass, sales engineer, Foote Mineral Co., Philadelphia, has been named manager of metallurgical sales. Prior to joining the company in 1945 Mr. Cass was associated with Baldwin Locomotive Works and Cramp Shipbuilding Co., Philadelphia, and U. S. Steel Corp.'s metallurgical department, Youngstown, O.

♦ ♦ ♦

Leonard W. Bughman, John J. Dowdle III, Bartley J. Fleming and **Willis P. Tuller** have been elected vice presidents, Great Lakes Carbon Corp., New York. Mr. Bughman will continue his present sales activities in the Electrode Division, Pittsburgh. Mr. Dowdle has rejoined the com-

(*Concluded on page* 117)

ROGER A. KENMAN
. . . machine tool sales

CHARLES J. PAUMIER
. . . joins Electric Furnace Co.

R. E. DICKISON
. . . heads Illinois Chapter

World's Largest
JOLT-SQUEEZE-STRIP MACHINE

Massive copes and drags of uniform standard are produced by the new 15-ton **SPO** Model 2364 jolt-squeeze-strip machine. Featuring **push-button control,** it is semi-automatic.

Machine is designed for **efficiency of operation, high production capacity and operator safety.** Squeeze head is power operated . . . jolt cycle is timer-controlled . . . squeeze cycle regulated by pressure switch . . . and two-speed vibrating and stripping operations automatically controlled.

Model 2364 has a squeeze capacity of 80,000 pounds, jolt of 4000 pounds and pattern draw of 14 inches. Flask space ranges up to 54 inches, left to right, and to 50 inches, front to back. Machine stands 166 inches overall and is recessed into floor 50 inches.

Write today for Bulletin No. 2000 for complete data.

271-SI

SPO INCORPORATED

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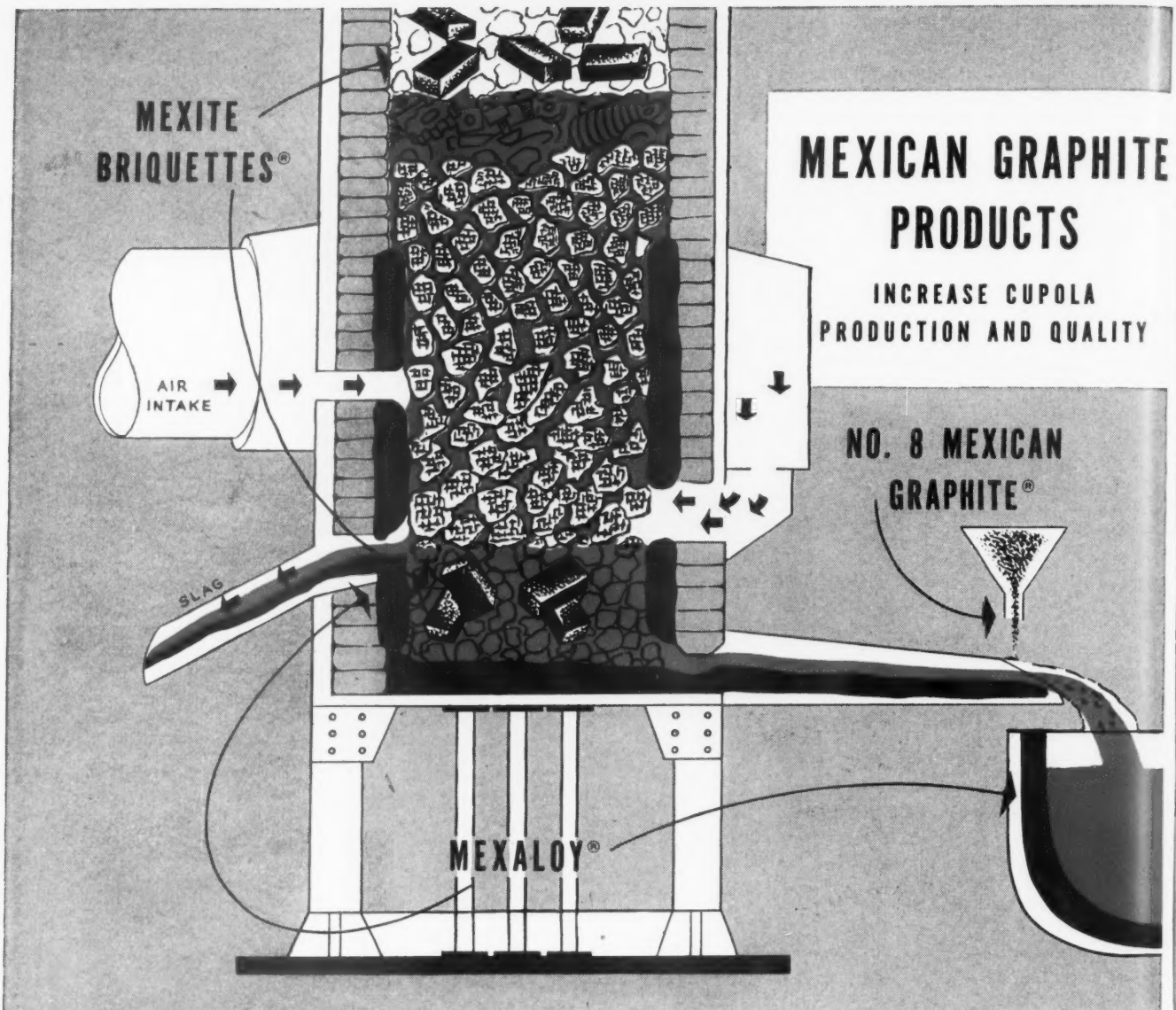


MEXICAN GRAPHITE PRODUCTS

INCREASE CUPOLA PRODUCTION AND QUALITY

MEXITE BRIQUETTES. One 4-lb. Mexite Briquette provides the same carbon content as 50 lbs. of pig iron when introduced into the cupola charge. Not only do Mexite briquettes sharply reduce melting costs per ton; they also *reduce the range of carbon content fluctuation* and give a steadier carbon analysis, a particularly vital factor when high percentages of steel are charged.

MEXALOY, applied to cupola linings, ladles, and spouts, resists molten metal and slag and keeps metal free from refractory inclusions. Its natural lubricating action provides low friction surfaces which part easily from metal and slag. A Mexaloy mixture is *easily applied to any clean surface.* Because it will not melt or change character under intense heat, Mexaloy gives longer refractory life with lower maintenance cost.

No. 8 MEXICAN GRAPHITE is used for ladle additions to treat grey cast iron. Trickled into the cupola spout as metal falls into the ladle or with a direct ladle addition, it greatly reduces chill and hardness, *producing castings of increased machineability.* Normally only 2 lbs. of No. 8 need be added per ton of molten metal — a cost of only ten cents per ton — to assure castings which require no annealing. Write today for complete information on how Mexite Briquettes, Mexaloy, and No. 8 Mexican Graphite will give you better castings for less money.

149

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

(*Concluded from page* 114)

pany as assistant to the president in New York. Mr. Fleming continues as director of personnel in New York and Mr. Tuller will remain director of traffic, in the Chicago office.

♦ ♦ ♦

James H. W. Conklin has been appointed general sales manager of the Philadelphia division, Yale & Towne Mfg. Co., succeeding **James P. Kinney** who has been named distributor of the company's products in Los Angeles and southern California. For the past year Mr. Conklin has been associated with Pangborn Corp., Hagerstown, Md., and previously was sales manager of the Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich. He served as president of the Materials Handling Institute in 1949.

♦ ♦ ♦

E. H. Holt has been named general sales manager, Barber-Greene Co., Aurora, Ill., succeeding **W. B. Holder** who will head a new division planned by the materials handling equipment company. **J. D. Turner** has been named director of publicity and promotion. Mr. Holt joined the company following graduation from University of Illinois in 1939. Following military service he became Washington area manager for the company and for the past year has been eastern division sales manager. Mr. Turner, who will work with Mr. Holt on overall sales policy and sales promotion, joined Barber-Greene in 1925, became advertising manager in 1929 and director of publicity in 1945.

♦ ♦ ♦

William J. Brosch and **Jack Gaylor** have been appointed to handle sales for the Brown Instruments Division in the new district office recently opened in Harrisburg, Pa., by Minneapolis-Honeywell Regulator Co., Minneapolis. **John Hopkins** will handle commercial and **Donald Schmick,** heating controls divisions sales.

♦ ♦ ♦

Frank W. Smith, vice president in charge of the Grinding Machine Division, Norton Co., Worcester, Mass., has retired following 33 years with the company. Mr. Smith will remain as consultant responsible for construction of the company's new machine division expansion. **Everett M. Hicks,** manager, will be responsible for operation of the division.

♦ ♦ ♦

H. Barden Allison has been named Philadelphia district sales manager, Mechanical Goods Division, United States Rubber Co., New York, succeeding **A. B. Means** who will continue as sales advisor. Mr. Allison, who attended University of Pennsylvania, has been associated with the company for 23 years.

♦ ♦ ♦

Harold E. Erf, for 12 years representative in northeastern Illinois for the Sterling Grinding Wheel Division, has been transferred to the home office in Tiffin, O., as a sales executive in administration. **John Andreas** and **Edward Kass** have been appointed sales representatives with headquarters in the Chicago district office.

♦ ♦ ♦

Percy Skewes has been appointed general manager, Lowell Iron Foundry Inc., Lowell, Mass.

♦ ♦ ♦

Frank L. Driver, president, and **Stanley M. Trocey,** executive vice president, Driver Harris Co., Harrison, N. J., have been elected chairman and president respectively of Italiana Societe Driver-Harris, Milan, Italy.

♦ ♦ ♦

Ashley C. Sinnett has been named treasurer, Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind. Mr. Sinnett was formerly treasurer, Benton Harbor Malleable Industries Inc. and was previously associated with Malleable Founders' Society and Texas Foundries Inc., Lufkin, Tex.

♦ ♦ ♦

Vernor L. Barbor Jr. has joined Exothermic Alloys Sales & Service Inc., Chicago. Mr. Barbor previously was associated with Drake Steel Supply Co., and Kaiser Steel Co. **Carl L. McVicker, formerly** with Algoma Steel Corp. Ltd., has been appointed Chicago representative for Exothermic Alloys Sales.

♦ ♦ ♦

Carson L. Ruyle, recently in the sales division, has been appointed advertising manager, Gardner-Denver Co., Quincy, Ill., succeeding **Damon P. Tunnicliff,** who has been called to active service in the Navy.

♦ ♦ ♦

Paul Martin was recently appointed foundry foreman, Cleveland Brass Mfg. Co., Cleveland. Mr. Martin was previously associated with Akron Brass Mfg. Co., Wooster, O., Gluntz Brass & Aluminum Foundry Co., Cleveland, and more recently with Trojan Foundries, Dallas, Tex.

♦ ♦ ♦

George C. Floyd, since 1947 vice president, Thomas Steel Co., Warren, O., has been named vice president, Vanadium Corp. of America, New York.

♦ ♦ ♦

John R. Bausch has been appointed vice president in charge of finished products, Dodge Steel Co., Philadelphia.

♦ ♦ ♦

Harry M. Hadley, formerly east coast sales engineer, the Coleman Co., Wichita, Kans., has been appointed sales manager, Fageol Heat Machine Co., Detroit.

JAMES H. W. CONKLIN
. . . sales mgr., Yale & Towne

E. H. HOLT
. . . materials handling sales

J. D. TURNER
. . . publicity, Barber-Greene

AROUND THE COUNTRY

News Reports from . . .

THROUGH use of a "Facilities Wanted" report, the local U. S. Department of Commerce, in co-operation with other regional offices, is assisting prime contractors in finding foundry capacity for subcontracting work. This report lists the prime contractor's name, the finished product he is making, and a description of the casting or castings he needs.

The department tries to find the necessary foundry capacity in the Cleveland area to do the job. If it is not found, copies of the report are distributed to other Department of Commerce areas where open foundry capacity is believed to exist. When and if the foundry or foundries having the necessary capacity is found, the prime contractor is notified.

Instituted by George A. Moore, Cleveland regional director of NPA Division, U. S. Department of Commerce, the plan has been successful in many instances. Recently, capacity in a group of six foundries located in different parts of the country was found to fill an order for 100,000 lb of gray iron castings for a machine tool builder. At present a sizable number of requests for ferrous and nonferrous castings for Cleveland and out-of-town fabricators are awaiting takers.

Although numerous firms notify the department of their need for castings, few foundries make known available capacity they might have. About once a week a member of the department, in an effort to keep currently informed, contacts foundries he thinks might have available capacity.

A NEW General Overriding Regulation No. 21 has been issued by OPS. It is designed to promote price adjustments pursuant to the provisions of that section of the Defense Production Act known as the "Capehart Amendment."

The regulation apparently would permit applications for price adjustments for those under CPR-60, the Castings Order.

However, a word of caution is believed in order for castings producers who may consider using GOR 21, since the regulation is quite complicated and there is considerable doubt as to just how it could be used by foundries.

A foundry which applied for an adjustment of prices would be obliged to apply at the same time for adjustment of all prices, both those made in the "Base Period" and "New Commodities."

Base period commodities are those made between Jan. 1 and June 24, 1950. The "base period price" of these commodities is the price to the "largest buying class of purchaser during the base period." It is not clear whether all castings are "commodities" or whether each individual pattern constitutes a separate commodity.

Section 11 relates to new commodities. The method of pricing new commodities is not at all clear (see Section 11a and 11b). Even assuming that patterns not run in the base period result in the production of "new commodities," it would apparently be necessary for the foundry to develop a price for that casting under CPR 60, but then adjust that price in accordance with its "unit cost" during the period Jan. 1 to June 30, 1950, and finally develop a unit cost as of July 26, 1951 and adjust the price upward or downward depending upon whether the 1951 unit cost was higher or lower than the 1950 unit cost.

There is, in other words, serious doubt as to whether or not as a practical matter foundries can make any use of GOR 21.

COMPETITION from erstwhile customers is giving jobbing foundries here a hard time. Having lost a good share of automotive castings volume to the captive shops, some job casters say they are finding instances of these shops seeking production runs and putting in bids for attractive work at prices which the less well mechanized units can't come close to matching.

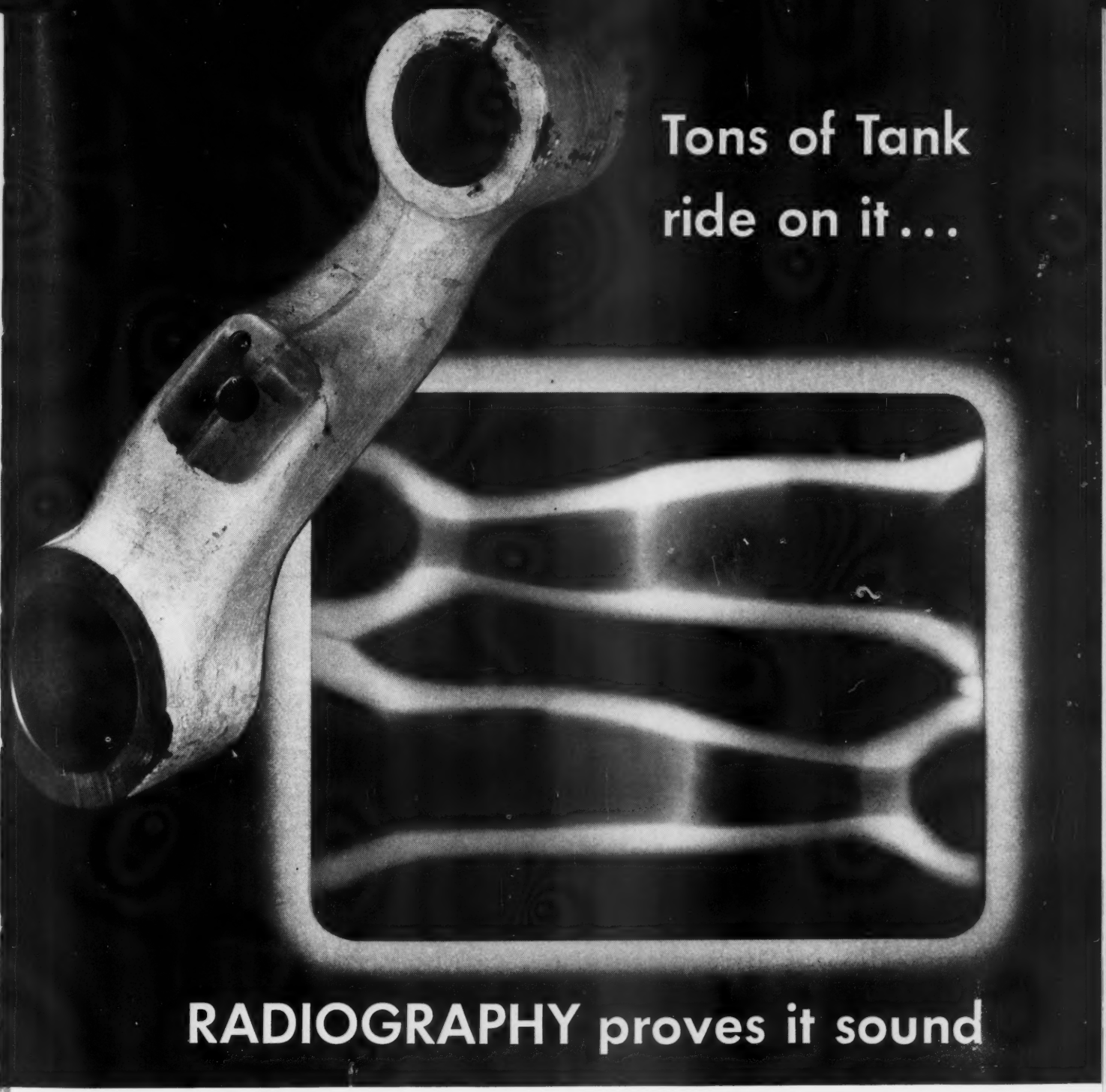
This problem likely will worsen unless more military work is available to offset the drop in civilian demand. Pressure is being generated to allow a higher level of civilian goods production or a speed-up in military goods scheduling.

Though many job shops are operating five days a week, they have reduced their employment materially and the melt in many cases is only 50-60 per cent of last year's level. One foundry, which partially mechanized in preparation for this kind of market, states it is able to operate the mechanized departments and would not be running at all now except for the cost saving it achieved.

Light demand is largely limited to those shops making items for consumer products. Foundries whose customers are in the capital goods industries, such as machine tools, are busy and steel foundries on the whole are solidly booked.

Deep secrecy by automakers on

(*Concluded on page* 121)



RADIOGRAPHY proves it sound

It's the arm that carries the rear caterpillar track wheel of a tank. Failure would mean complete disablement—so soundness in the casting is a "must."

To make sure, the casting is radiographed. It's the one way to learn internal conditions without destroying the part.

Cases like this show why radiography is becoming routine in foundries everywhere. It helps earn a reputation for constant top-quality work—frequently suggests changes in operations that bring higher yields in production runs.

Your x-ray dealer will be glad to discuss ways radiography can increase your production. Get in touch with him. Also send for a free copy of "Radiography As A Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important function of photography

Kodak
TRADE-MARK

DIXIE BOND

(Your test proves it's best!)

SOUTHERN BENTONITE

The Winner . . . the Best!

The Original — and ALWAYS the Best

Now, as never before, *production must not lag.* Now, more than ever, your good money must buy:

1. The very finest, uniform quality.
2. The very closest laboratory control.
3. Deliveries you can count upon.
4. After delivery, prompt service that you can trust.

Do you want these advantages at no higher price? Then you want the original and largest selling Southern Bentonite — DIXIE BOND.

EASTERN CLAY PRODUCTS, INC.
JACKSON, OHIO

DIXIE BOND • BLACK HILLS BENTONITE
REVIVO BOND • REVIVO SUPER BOND
BALANCED REVIVO

E C P

BONDING CLAYS and EXCEPTIONAL FOUNDRY SERVICE

Since 1926

BONDACTOR EQUIPMENT • CUPOLINE REFRACTORY • DURA PRODUCTS

(*Concluded from page* 118)

their use of the shell molding process has been carried to the ultimate extreme. Even the vice presidents of one of the largest companies are reportedly barred from seeing its shell molding machinery in action. Military secrecy continues to shroud the development of several units which have been built for casting jet engine parts by this process.

Los Angeles

FOUNDRY activity is spotty and average activity is tending lower in this district. Nonferrous foundries are the busiest, followed by steel foundries. Iron foundries are the least active.

Affected by seasonal trends in agriculture and manufacturing, iron foundries report production down 20 per cent from recent levels. Inventories of casting users generally are good, and iron foundrymen look for no upturn in demand until March. Backlogs of steel foundries are good and activity is maintained at peak levels.

Defense work is increasing rapidly for steel foundries, and such business is expected to remain at 35-40 per cent of the total for the forseeable future. Backlogs for these shops extend for several months, some orders being scheduled for delivery through October.

Foundries furnishing castings for floor furnace, heater, and builders hardware manufacturers are hard hit by the slump in building.

Backlogs of nonferrous foundries are at peak levels, showing no effect of seasonal trends felt by other foundries. Some large jobs are being refused by nonferrous foundries because they would require too great a percentage of foundry capacity. Some aluminum and brass foundries are pouring 50 per cent more tonnage than at end of World War II.

Short supply of some raw materials hampers all foundry operations. Coke and cast scrap are plentiful but pig iron is short. Nickel-bearing alloys and nonferrous metals are scarce.

Chicago

ARMY ORDNANCE contract for reactivation of the country's largest steel foundry, the government-owned cast armor plant at East Chicago, Ind., and the production of a large number of tank hulls and turrets has been awarded to American Steel Foundries.

Announcement of the signing of the contract was made jointly last month by Col. Robert K. Haskell, chief of the Chicago Ordnance District, through whose office the contract was negotiated, and C. C. Jarchow, president, American Steel Foundries, which designed and built the plant early in World War II.

Conditioning of the plant has been under way for several months under a letter order agreement. Mr. Jarchow expects that production, now in the development stage, will reach a peak next fall. At present the plant has 2400 employees, and a total of more than 6000 is expected when operations reach the peak. Peak employment in World War II was around 4000. Wartime output of the plant, operated by American Steel at that time also, totaled more than 70,000 tons of tested heavy duty armor castings, chiefly tank turrets.

The East Chicago plant was erected at a cost of approximately $26 million, about half of which went for specially designed equipment. Construction was started early in 1942 and the plant was placed in operation in October of the same year. Plant area consists of some 90 acres, located on the Indiana Harbor Canal, about 30 acres of which are under roof. Plant is equipped with 6 open-hearth furnaces. Since the end of the war the plant has been retained by the government as a reserve industrial facility and used partially for storage of surplus equipment by the War Assets Administration.

TV PROGRAM FEATURES FOUNDRY INDUSTRY

Show cast included Harry Sanders (left), Battelle Memorial Institute and Dr. Douglas Williams, Ohio State University, Columbus, O.

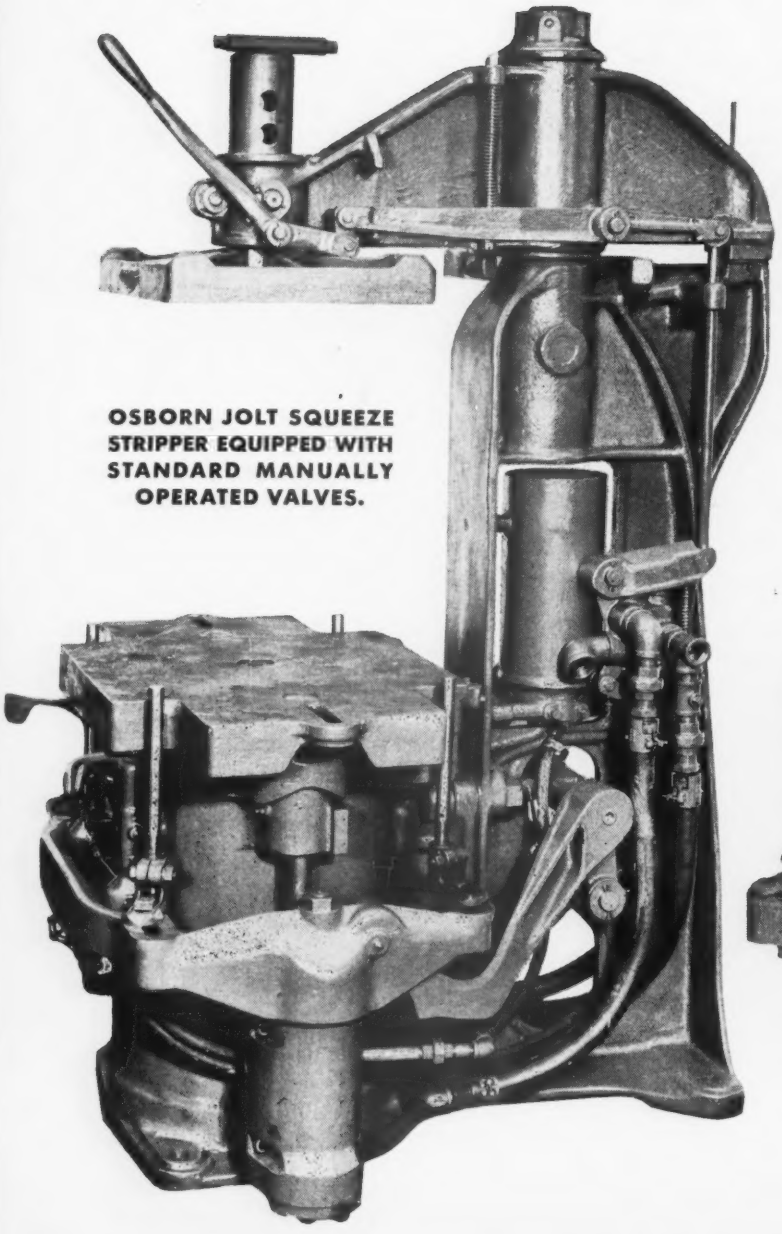
CENTRAL Ohio Chapter of the AFS, in co-operation with the Columbus (O.) Technical Council and Station WBNS-TV, that city presented a half-hour television program entitled "Of Molds and Men" Nov. 18. It was one of a series known as "Engineering Your Life" sponsored by the council.

The program opened with a kitchen scene where various domestic cast objects were pointed out. This was followed by a discussion of industrial uses for castings their characteristics and properties. To illustrate how castings are made a sand mold was prepared and poured with a low-melting-point alloy to cast a decorative bookend. Then other applications of castings in industry, household, art, etc. were cited, together with data on the history and importance of the foundry industry. The program was concluded with a discussion of opportunities for young men in the foundry and the duties of the foundry engineer.

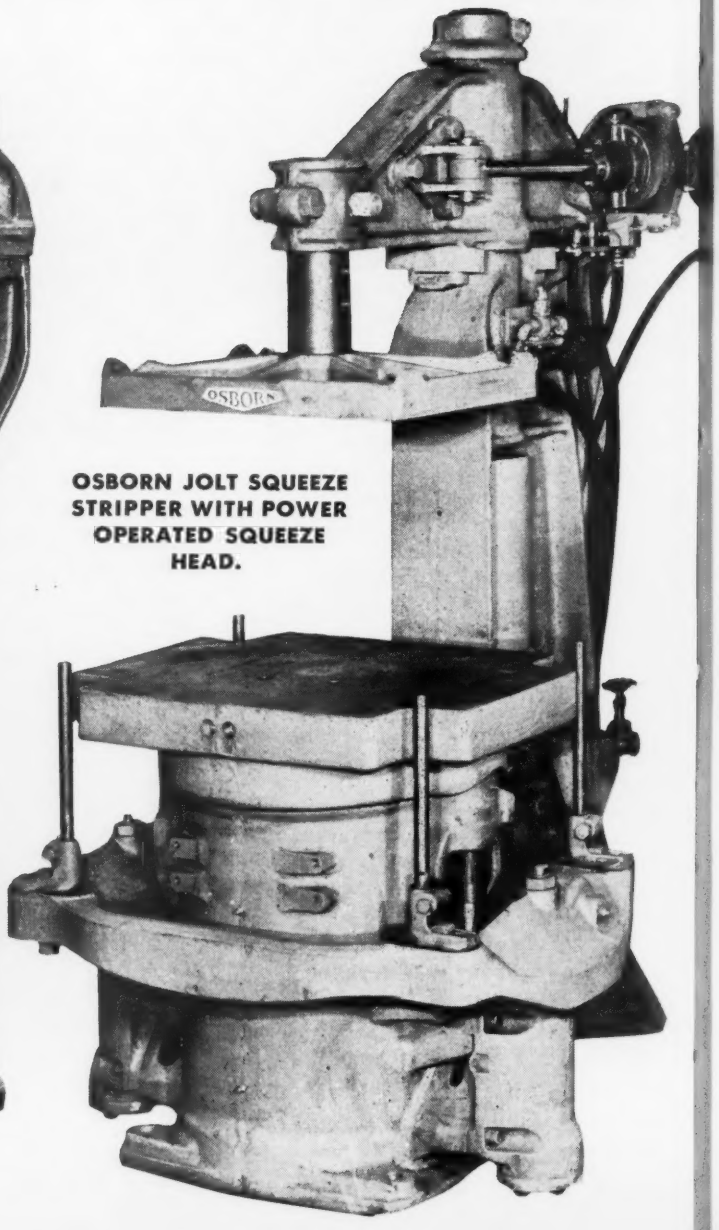
Participants in the program were Dr. Douglas Williams, Ohio State University, Harry Sanders, Battelle Memorial Institute, and Richard H. Bell, WBNS-TV. H. W. Lownie Jr. of Battelle is television chairman of the Central Ohio Chapter.

HERE'S WHY OSBORN JOLTS

RATE *First*



OSBORN JOLT SQUEEZE STRIPPER EQUIPPED WITH STANDARD MANUALLY OPERATED VALVES.



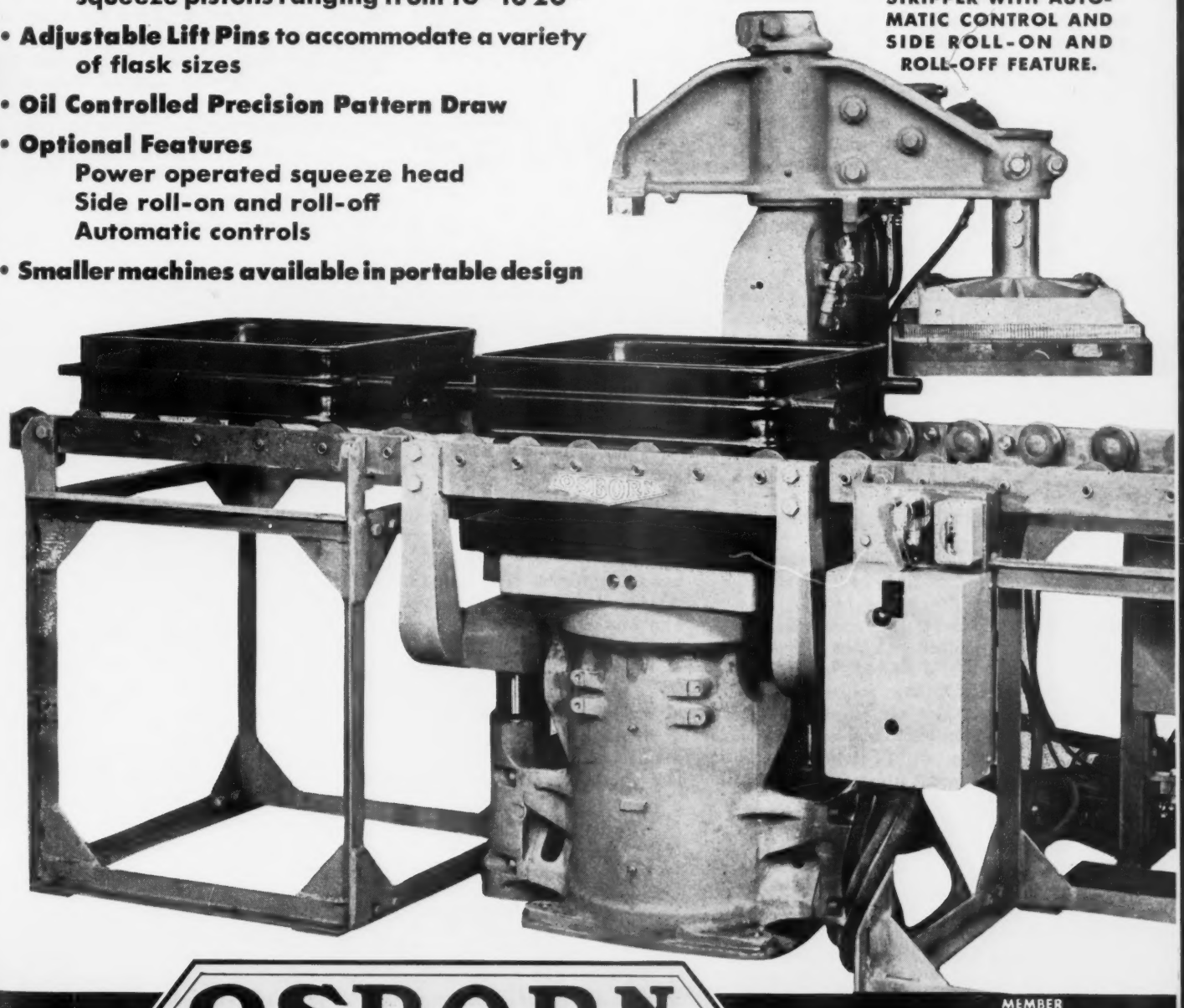
OSBORN JOLT SQUEEZE STRIPPER WITH POWER OPERATED SQUEEZE HEAD.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

LSQUEEZE STRIPPERS

t with Foundrymen

- **Dependable Construction** backed by years of Osborn foundry-proven experience
- **Hard Effective Jolt**
- **Wide Range to Choose From** . . . diameters of squeeze pistons ranging from 10" to 26"
- **Adjustable Lift Pins** to accommodate a variety of flask sizes
- **Oil Controlled Precision Pattern Draw**
- **Optional Features**
  - Power operated squeeze head
  - Side roll-on and roll-off
  - Automatic controls
- **Smaller machines available in portable design**



OSBORN JOLT SQUEEZE STRIPPER WITH AUTOMATIC CONTROL AND SIDE ROLL-ON AND ROLL-OFF FEATURE.

OSBORN

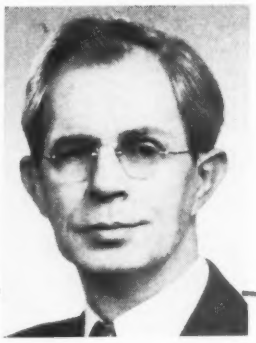
MOULDING MACHINES CORE BLOWING MACHINES

MEMBER MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

MAN-TO-MAN

on the Molder's Bench

"Thought Starters"



By RALPH L. LEE

AS I have hinted any number of times, an employee of a one-man shop such as the Lee Hobby Foundry has to be very careful lest he fritter away his time on brainstorms instead of knuckling down to the business at hand.

On the other hand, I say to myself, maybe the opportunity to wander and fritter is the main advantage of the L. H. F. and I ease my conscience as I stray with the thought that maybe I can try out things the busy production boys would like to tackle but don't have time.

I can't help but think that *there's gold in them thar sand hills* waiting to be panned out if we don't get fed up with all the panning it usually takes.

I ran into one thought starter by accident some time back. I rammed up a mold, drew the pattern, closed the mold and, for some reason I can't remember, I opened it up again. But for still another reason I can't remember, I had poked the sprue back in the hole again.

In shaking out this casting, a good one by the way, I couldn't believe my eyes when I discovered that it had been fed through a tiny little hole in the bottom of the sprue—less than one eighth of an inch in diameter. Talk about necked down risers and stuff, this was necking carried to the nth.

The sprue stick had a nail in the bottom of it and while poking it back into the hole it must have scraped sand from the side and rammed it around the nail. The funny thing is that while pouring, the mold seemed to fill just about the same as usual and, as I said, the casting turned out to be good—excellent, in fact—particularly free from dirt.

As a result of this experience I have been necking down sprues for fare-thee-well and to a size I never would have thought possible. While I haven't thought this thing clear through—the old venturi principle comes to mind—along with the pros and cons of strainer cores. And of this I am quite sure, dirt doesn't go racing down into the mold, and there isn't so much washing through the runners and gates into the mold itself. I guess what we've got here is sort of a one-holed green sand strainer core which also serves as a valve for controlling the speed of flow down into the mold and through it. Of course I may be seeing things.

Anyway, I'm not through with this brainstorm by any means—I have a hunch it might help take some of the mystery out of the size, shape and distribution of gates by controlling the flow of the metal before it gets to them. Here again is another demonstration of one of the advantages of being an amateur. With no professional standing to defend or uphold, he can just cut loose and stick his neck out a mile and enjoy every minute of it.

One passing thought, though, before we drop this item. Since the nail hole sprue adventure I have been paying a whole lot more attention to the surface finish or the smoothness of my sprues, runners and gates, also chamfers and fillets throughout the feeder system. Remembering what friction, due to sharp edges, right angled bends, pipe scale and roughness can do to the flow of water in pipes, I can't see any reason why the plumbing inside a mold shouldn't follow suit. I also have a hunch that the more friction we have in this plumbing system the more dirt we'll find in the casting. Well, anyway, as far as I'm concerned, there's quite some distance to go in this direction and my heart is set on making the trip.

I got to thinking about the different methods I've seen, while visiting foundries, for getting rid of the metal left in pouring-crucibles and ladles. Some have pig molds made of iron, some just pour into a slight hole on the floor and others any place they can find. I've seen some who made neat pig molds with patterns in sand.

Being the old copycat I am I guess I've tried them all, although you've got to keep in mind the midget tonnage in the Lee Hobby Foundry. I made a pattern and cast up a pig mold out of iron, but due to my spotty heats, coating the mold and then heating it up, it turned out to be more fussing around than it was worth.

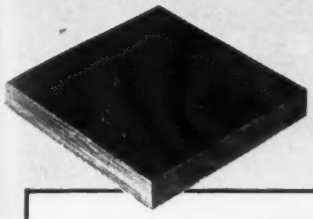
Then I made a board with pig patterns on it which I rammed up in a jacket before pouring time. But sometimes I forgot it and had to run around like a chicken with its head off looking for a likely spot. The last time this happened one of these brainstorms struck right out of the blue. I got a small tin can and ran on down to the house with it where I cut out the bottom with Mother's crank-operated can opener.

Now here's what I did with it. I went to the sand heap, patted down a place and shoved the bottomless and topless can down into the sand like cutting a king-size sprue. Then I gave the sand inside a few tamps with my fingers and lifted out the can with the sand inside, leaving the sprue mold. I find that I can put these holes as close together as I want them—so close, in fact, that I can take care of more metal in a given space than any other method I've tried. The pigs turn out to be the right size and shape for charging either iron or non-iron.

While I realize that this simple idea doesn't put me in a class with Einstein or Edison, it sure does solve a problem for me and I wouldn't be a bit surprised if it didn't help someone else. After all it's research in one of its most elementary forms.

One day, while trying out my new molding machine I looked around for something in the way of a pattern that would call for a deep draw. I wanted to see what kind of mold hardness I could get on the sides, as well as smoothness. Couldn't find anything in the foundry so I went down to the house. Without too much

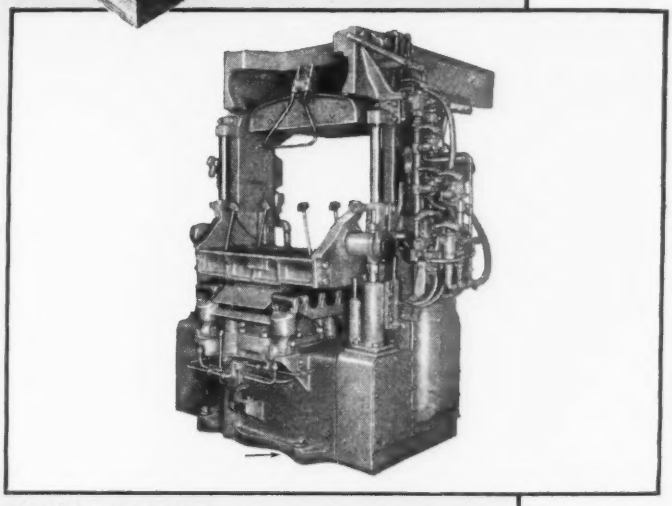
(*Concluded on page* 158)



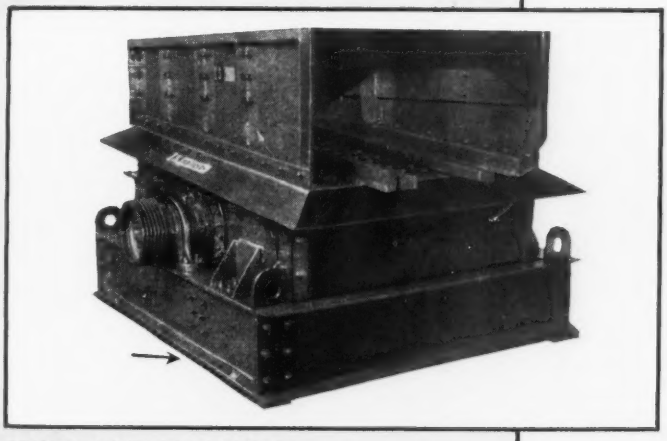
FABREEKA

Mountings For

FOUNDRY MACHINES



JOLT MOULDER



SHAKEOUT MACHINES

TUMBLING BARRELS

IT PAYS TO SPECIFY FABREEKA

THE FOUNDRY is one of a wide variety of industries in which FABREEKA has been used for many years for mounting heavy equipment where the absorption of impact shock and the isolation of transmitted vibration is desired. By adjusting itself to slight inaccuracies of bearing surfaces, FABREEKA distributes the load properly, prevents chipping or breaking of concrete and prolongs the life of both machines and building. FABREEKA reduces noise, prevents structural fatigue, helps maintain alignment, eliminates grouting, and reduces maintenance and breakdowns. FABREEKA is built to give years of service under the most severe operating conditions.

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NEW YORK CHICAGO DETROIT SPARTANBURG
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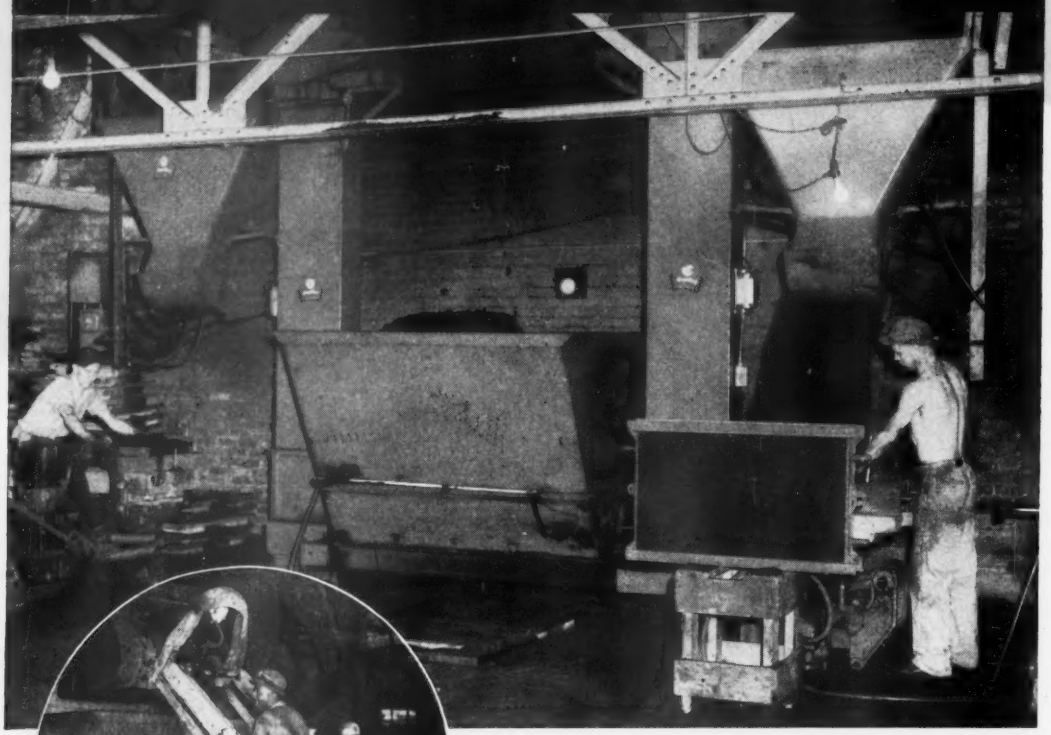
"substantial production increase"

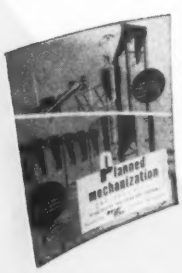


...results from use of HANDY SANDY on roll over work

PEERLESS FOUNDRY COMPANY, Cincinnati, Ohio, has reduced their cost per casting through use of the Handy Sandy to convert shoveling time into molding time. "The Handy Sandy's," says Stephan F. Dana, President, "have increased our production substantially which, of course, is important. However until we had these units there were certain jobs that required so much sand shoveling that it was injurious to the molders and they were constantly complaining. Since the installation of these units we do not have this difficulty and because the work is so much easier for the men the attendance records are a great deal better."

Both Handy Sandy Units are fed from a central hopper which is filled by a Payloader. They lift the sand overhead where it is available to the molders without bending or effort . . . enabling them to devote full time to molding.

Because of the highly satisfactory performance of their Handy Sandy installation, Peerless Foundry has since ordered a second compound unit as shown above.



The advantages of the Handy Sandy are graphically described in a complete new catalog "PLANNED MECHANIZATION FOR FOUNDRIES." This 20-page manual shows how the Handy Sandy combines with the Reddy Sandy portable shakeout and sand preparing unit to eliminate all shoveling from the shakeout, sand preparing and molding cycle. SEND FOR YOUR FREE COPY TODAY.

NEWAYAGO ENGINEERING COMPANY

NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

STANDARD SPECIFICATIONS FOR FERROVANADIUM

ASTM Designation: A 102—50

Adopted, 1927; Revised, 1939, 1950.

Scope

1. These specifications cover three grades of ferrovanadium designated A, B, and C.

Basis of Purchase

2. (a) The material furnished under these specifications shall be crushed to the specified size, and mixed before packing, so that the quality in each package is uniform with the lot.

(b) The reported percentage of vanadium as obtained by chemical analysis shall be used to determine the billing of the material to the purchaser.

Chemical Composition

3. (a) The material shall conform to the requirements as to chemical composition prescribed in Table I.

Inspection

5. (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the sampling, packing, and shipping of material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications.

(b) If the purchaser so elects, the material may be sampled by him at the destination, in which case at least 10 per cent of the containers shall be sampled.

Rejection

6. Any claims or rejections based on check analysis shall be made to the manufacturer within 30 days from receipt of material by the purchaser.

Table 1—Chemical Requirements[a]

	Grade A	Grade B	Grade C
Vanadium, per cent	30.0 to 40.0	35.0 to 45.0	35.0 to 45.0
Carbon, max., per cent	3.5	0.50	0.20
Phosphorus, max., per cent	0.25	0.10	0.10
Sulphur, max., per cent	0.40	0.20	0.10
Silicon, max., per cent	13.0	3.5	1.2
Aluminum, max., per cent	1.5	1.5	1.2

[a] For purposes of determining conformance with these specifications, the reported analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of the Recommended Practices for designating significant places in Specified Limiting Values (A.S.T.M. Designation: E 29).

[b] For purposes of determining the vanadium content of any shipment, vanadium shall be reported to the nearest 0.01 per cent, applying the same rounding-off as prescribed in Footnote a.

(b) The manufacturer shall furnish an analysis of each shipment showing the vanadium content and, when required, such of the other elements specified in Paragraph (a).

Packing

4. Ferrovanadium shall be packed in sound containers in such manner that none of the metal is lost in shipment.

Sampling

7. The material shall be sampled in accordance with the Standard Methods of Sampling Ferro-Alloys (A.S.T.M. Designation: E 32)

Chemical Analysis

8. The chemical analysis of the material shall be made in accordance with the procedure for ferrovanadium as described in the Standard Methods of Chemical Analysis of Ferro-Alloys (A.S.T.M. Designation: E31)

STANDARD SPECIFICATIONS FOR FERROCHROMIUM

ASTM Designation: A 101—50

Adopted, 1942; Revised, 1950.

Scope

1. These specifications cover two grades of ferrochromium designated: High-carbon and Low-carbon.

Basis of Purchase

2. (a) High-Carbon Ferrochromium shall be furnished to size as specified.

(b) Low-Carbon Ferrochromium shall be crushed to the specified size and mixed before packing, so that the quality in each package is uniform with the lot.

(c) The reported percentage of chromium as obtained by chemical analysis shall be used to determine the billing of the material to the purchaser.

Chemical Composition

3. (a) The material shall conform to the requirements as to chemical composition prescribed in Table I.

(b) The manufacturer shall furnish an analysis of each shipment showing the chromium content and, when required, such of the other elements specified in Paragraph (a)

Packing

4. Ferrochromium shall be packed in sound containers, or shipped in bulk, in such manner that none of the metal is lost in shipment.

Inspection

5. (a) The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the sampling, packing, and shipping of material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications.

(b) If the purchaser so elects, the material may be sampled by him at the destination, in which case at least 10 per cent of the shipment shall be sampled.

Table 1—Chemical Requirements[a]

	High Carbon Ferrochromium	Low Carbon Ferrochromium
Chromium, per cent[b]	60.0 to 75.0	65.0 to 75.0
Carbon, per cent	4.0 to 8.0	2.0 max.[c]
Silicon, max., per cent	3.0	1.5

[a] For purposes of determining conformance with these specifications, the reported analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of the Recommended Practices for Designating Significant Places in Specified Limiting Values (A.S.T.M. Designation: E 29).

[b] For purposes of determining the chromium content of any shipment, chromium shall be reported to the nearest 0.01 per cent, applying the same rounding-off procedure as prescribed in Footnote a.

[c] May be obtained with the following maximum percentages of carbon: 2.0, 1.0, 0.50, 0.20, 0.15, 0.10, 0.06, and 0.04.

Rejection

6. Any claims or rejections based on check analysis shall be made to the manufacturer within 30 days from receipt of material by the purchaser.

Sampling

7. The material shall be sampled in accordance with the Standard Methods of Sampling Ferro-Alloys (A.S.T.M. Designation: E 32).

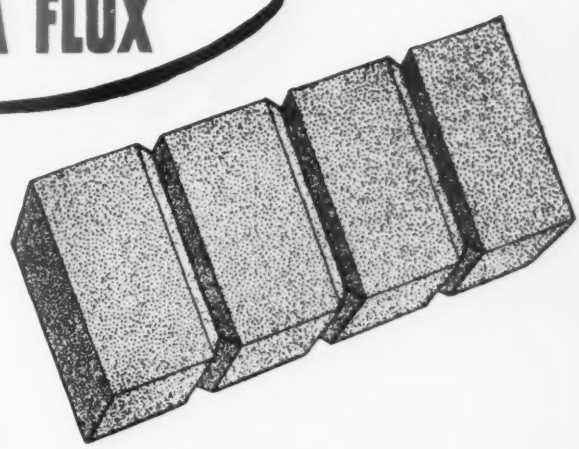
Chemical Analysis

8. The chemical analysis of the material shall be made in accordance with the procedure for ferrochromium as described in the Standard Methods of Chemical Analysis of Ferro-Alloys (A.S.T.M. Designation: E 31).

A New Year's Resolution that will pay off throughout the entire year and years to come--with Better Castings--

"WE WILL FOLLOW THE EXAMPLE OF MANY LEADING FOUNDRIES AND CLEANSE OUR MOLTEN METAL WITH

Famous CORNELL CUPOLA FLUX"



● Famous Cornell Cupola Flux has a background of more than 34 years' success in making iron better for better castings.

It not only purges molten iron of impurities but makes it more fluid and reduces sulphur. Furthermore, it greatly increases efficiency in cupola operation by keeping it cleaner, and reduces maintenance time and labor amazingly.

PRE-MEASURED SCORED BRICK FORM takes practically no time and labor to use.

The same benefits are reported by malleable foundries with cupolas.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

FOUNDRY Data Sheet
January 1952

QUAD CITY REGIONAL CONFERENCE

Offers Informative Program

By ERLE F. ROSS
Chicago Editor
FOUNDRY

UNDER the challenging slogan of "Better Castings Through Knowledge," the Quad City Chapter of the AFS conducted an outstanding regional foundry conference Nov. 8-9 at the Blackhawk Hotel, Davenport, Iowa. An excellent program was provided and registered attendance approximated 340, but it was not until the chips were down that success of the event was assured. The seasonally premature frigid wave and heavy snows which blanketed the midwestern states starting five days earlier and abating less than 24 hours before the opening session caused the sponsoring committee considerable anxiety.

This was the third foundry conference in the Quad City area. First was 21 years ago—in 1930—and second was in 1945.

Conference Personnel

Conference chairman was A. D. Matheson, general manager, French & Hecht Division, Kelsey-Hayes Wheel Co., Davenport, Iowa; and co-chairman was Quad City Chapter Chairman W. C. Bell, assistant sales manager, Frank Foundry Corp., Moline, Ill. Program director was Eric Welander, metallurgist, Union Malleable Iron Works, East Moline, Ill. R. E. Miller, foundry engineer, John Deere Planter Works, Moline, was secretary.

Other committee members included Boyd L. Hays, manager, Union Malleable Iron Works, East Moline, Ill.; C. R. Marthens, owner, Marthens Co., Moline; C. S. Humphrey, president, C. S. Humphrey Co., Moline; Harold Rasmussen, president, General Pattern Corp., Moline; Clifford Erickson, foundry superintendent, Frank Foundries Corp., Moline; and A. H. Putnam, president, A. H. Putnam Co., Rock Island.

AFS National President Walter S. Seelbach, president, Superior Foundry Inc., Cleveland, made the opening address of the conference. He was introduced by Conference Co-chairman Bell. After explaining the purpose and activities of the AFS and highlighting the International Foundry Congress to be held in Atlantic City next May, Mr. Seelbach touched briefly on the industrial situation in Europe as he had observed it on a recent visit there. His experience, he said, was a warning against nationalization of industry. Europeans are trying hard to solve their foundry problems despite unsettled conditions and various political ideologies.

The Foundry Educational Foundation has not told its story and objectives too well to foundries, observed George Dreher, executive director, FEF, Cleveland, in an address "You Can Help." He was introduced by Eric Welander. Mr. Dreher said reason it did not present its case well was that during the first four years of existence the major effort was spent with educational institutions and students and in getting the program in operation.

He recalled that at the outset of World War II, the foundry industry was not recognized as important. Now it is so recognized. The industry needs trained men to bring about engineering and technical progress. But despite the fact that the FEF program is functioning in 14 schools it cannot supply all of supervisory and management talent needed. In describing how the FEF program operates, Mr. Dreher mentioned that up to now over 900 students have done summer work in foundries.

Addressing the first day's luncheon, at which Mr. Bell presided, John T. Brown, vice president in charge of production, J. I. Case Co., Racine, Wis., dealt with the "Importance of Supervision in Today's Problems." He advocated confining the activities of supervisors to two main categories —Productivity, and creating a better understanding of the fundamental problem of what is happening to us. Depend upon the supervisor to maintain production, he said. People do understand that somebody is going to have to produce a lot of goods. If we produce less and less, we can't have more and more.

A degrading situation has developed the last 10 or 12 years because of the lack of competitive conditions, Mr. Brown observed. We have forgotten many fundamental things. We must dispel the feeling that we can lean on the government and yet remain free.

Better and better supervision is needed he emphasized, but as to how to get it and keep it, there is no cut and dried formula. Management must determine its basic philosophy and make sure that its supervisors understand it also. People will look for leadership, and they will find it, Mr. Brown warned, but it will not always be good.

The cupola is fundamentally a remelting furnace in which a predetermined mixture of various grades of materials is charged to be melted to a metal of a composition to produce a specified grade of casting. This was a definition given by W. R. Jaeschke, consulting foundry engineer, Whiting Corp., Harvey, Ill., in a paper on "Cupola Practice." The speaker was introduced by Roy P. Ray, foundry superintendent, J. I. Case Co., Bettendorf, Iowa, as session chairman.

Use Substitute Materials

Scarcity of raw material of preferred choice is the major cupola operating problem today, he asserted, making it necessary to learn to use substitute materials and obtain as commercially satisfactory results as in the past and even more to keep up technological advancement and improvement of product. In order, Mr. Jaeschke discussed the quality of pig iron, scrap and coke, available to the cupola operator today and in connection with each suggested operating practice which will produce optimum results.

An unfavorable type of charging bucket may be responsible for high coke consumption and excessive loss of lining. Any chute loading device like the wheelbarrow, high-wheeled buggy or side-dumping skip bucket cannot distribute materials properly in the cupola. In this connection, the cone bottom bucket distributes the materials around the periphery of the cupola to best advantage, but it is essential that the bucket be loaded uniformly.

The speaker also discussed cold blast versus hot blast operation, oxidation losses, desulphurization, blast pressures, tuyere arrangements and automatic air weight controllers and such desirable auxiliary equipment as mixing reservoirs and hot blast systems.

"Pneumatic Core Sand Transportation," discussed by J. H. Kaufmann, foundry engineer, Studebaker Corp.,

(*Continued on page* 133)

Soffel's

THERMOTOMIC COMPOUNDS
(Patented)

and EXOTHERMIC CARBON FREE LIQUIDIZERS

Keeps metal molten!

. . . for Steel, Iron, Aluminum, Brass, Bronze, Copper

THERMOTOMIC is a patented Exothermic compound that can be molded into any desired shapes and used as feeding inserts under risers or as facing application where it is desired to maintain fluidity of the casting metal. THERMOTOMIC permits reversal of the trend towards large feeding heads and risers, making it possible to use heads that are shorter and more compact with very small feeder openings. This permits easy removal of heads and gates and sharp reductions in cleaning and finishing costs. When THERMOTOMIC is used as inserts or as facing in the mold, heat at thin metal sections is retained until the main body of the casting has solidified, thus eliminating shrink cracks and improving grain structure and tensile strength.

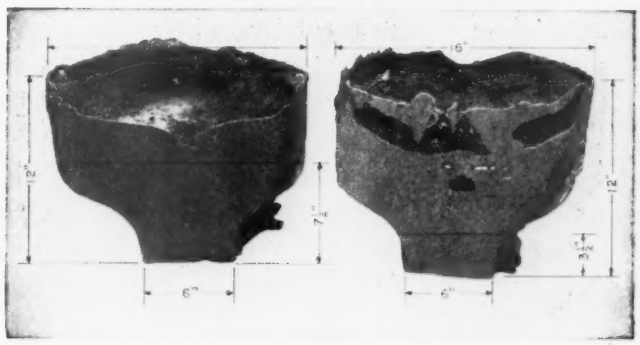
300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.

Thermotomic ABC and AL-X31 for Aluminum and Magnesium Castings

THERMOTOMIC ABC is the first successful exothermic feeding compound ever to be developed for aluminum and magnesium castings. Results obtained from its use are amazing. Feeding metal in heads or risers is maintained in the fluid state for 20 to 30 minutes. Great savings are effected through reduced riser dimensions. Feeding heads or risers are reduced in volume 80% and more, and their removal from the casting is greatly facilitated due to the restricted feeding necks.

SOFFEL'S AL-X31 LIQUIDIZER was developed for use in conjunction with THERMOTOMIC ABC. In order to secure best results and maximum feeding, we strongly recommend that AL-X31 LIQUIDIZER be applied on the feeding heads or risers. When so applied, AL-X31 LIQUIDIZER enters into an intense exothermic action which will actually raise the temperature of the feeding metal. The heat produced is sufficiently great that, even if the metal has solidified, it will re-melt. After AL-X31 LIQUIDIZER has completed its exothermic action, it forms a soft, insulating cover on the feeding metal. This cover confines the heat generated and further delays solidification of the feeding heads or risers.

SOFFEL'S CARBON FREE LIQUIDIZER PRODUCES GREATER YIELD



Steel Riser on left contains twice as much sound metal

These risers, made in the same mold, illustrate how Soffel's Carbon Free Liquidizer produces sounder castings and saves metal. The riser on the left, on which Carbon Free Liquidizer was used, contains more than twice as much sound metal as the riser on the right on which a common carbonaceous pipe eliminator was used. It is readily seen from this that the use of Soffel's Carbon Free Liquidizer permits substantial reductions in size of risers.

BEWARE OF IMITATIONS: We are the originators of Exothermic Carbon-Free Liquidizer.

PITTSBURGH METALS PURIFYING COMPANY

Manufacturers of Quality Purifying "Fluxes for all Metals and Alloys"

1352 Marvista Street **Pittsburgh 12, Pa.**

TUBE SWELLING WILL NEVER KILL THIS HOSE

*Concord #20**

STEAM HOSE

Here's the steam hose that gives you the exclusive protection of a tough inner lining of stainless steel wire braid.

Actually, this durable lining represents a built-in *extra life.* Because it absolutely prevents the old steam hose bugaboo of tube swelling under continuous high pressure . . . assures permanent retention of original inside hose diameter . . . does away with swelling and constriction of tube . . . assures full flow of steam always . . . facilitates trouble-free recoupling.

What's more, CONCORD #20 construction includes: two or three braids (depending on size) of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube for maximum burst-protection and safety. An asbestos braid provides positive cover adhesion and serves as cover insulator. A rugged, abrasion-resistant cover withstands severest abuse.

For the best service — under even the worst conditions — get CONCORD #20 Steam Hose. Get in touch with your nearest BWH distributor today for a demonstration or write us direct.

SPECIAL STAINLESS STEEL INNER WIRE BRAID PREVENTS TUBE SWELLING . . . PREVENTS PRESSURE LOSS . . . ADDS LIFE.

Illustration shows how exclusive inner stainless steel wire braid prevents tube swelling, assures you of your greatest money's worth in CONCORD #20 Steam Hose . . . *because it lives longer!*

*Pat. applied for

BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

(*Continued from page* 130)

South Bend, Ind., proved to be a most interesting subject. Presiding was C. C. Fye, foundry superintendent, John Deere Harvester Works, East Moline, Ill. Assisting Mr. Kaufmann in the presentation and discussion were Ray Bopes, in charge of melting, John Madacey, in charge of molding, Emory Soos, in charge of coreroom, all from Studebaker Corp.; and Ray H. Moore, consulting engineer, Claude B. Schneible Co., Detroit.

Mr. Kaufmann's presentation was based on the article "Studebaker Doubles Foundry Capacity" appearing in FOUNDRY for September, 1951. This article, authored by Mr. Moore, and available to the audience in reprint, described pneumatic delivery equipment which is a feature of the sand distribution system. The speaker said that the big problem is aeration in the cone-bottom pressure tank and means of retarding the flow of sand out of it into the carrier pipe. It was his belief that a vertical type diversion valve would be superior to the horizontal type described.

In the subsequent discussion it was revealed that lubrication of the system is provided by blowing a gallon of kerosene through occasionally. Sand is now blown at 35 to 40 pounds air pressure; formerly 130 pounds was used. The lower pressure is adequate and reduces abrasion. Contrary to expectation, blown sand shows very low moisture loss.

Straight pipes wear well—they get highly polished. Elbows or curves wear; rubber is to be tried but there is fear of friction. Rubber in baffles or piping doesn't wear well if rigidly backed. Cost of delivery stations without controls is about $3000 each; might run $5000 with controls. Semi-skilled men are used for maintenance.

Further information revealed by Mr. Kaufmann and his associates was that the system, operated by eight men, blows 200 tons of sand per shift. It is believed that molding sand can be blown, but it has not been tried. There might be some question as to aeration. The system does blow new sand additions and dribbles them on the belt. No trouble would be expected in blowing shakeout sand. The system utilizes 4-inch pipe and it is capable of handling 20 blows per hour to deliver between 600 and 1200 pounds of sand.

Jack Major, the Kentucky colonel, humorist from Paducah, Ky., was speaker at the banquet served on evening of first day. His address, "Taxes, Women and Hogs," covered territory as extensive as the subject indicates. Conference Chairman Matheson presided.

Second day's program opened with a session on "Modern Methods of Producing Cores," with Zigmund Madacey, foundry superintendent, Caterpillar Tractor Co., Peoria, as the speaker. C. R. Marthens, president, Marthens Co., Moline, was chairman.

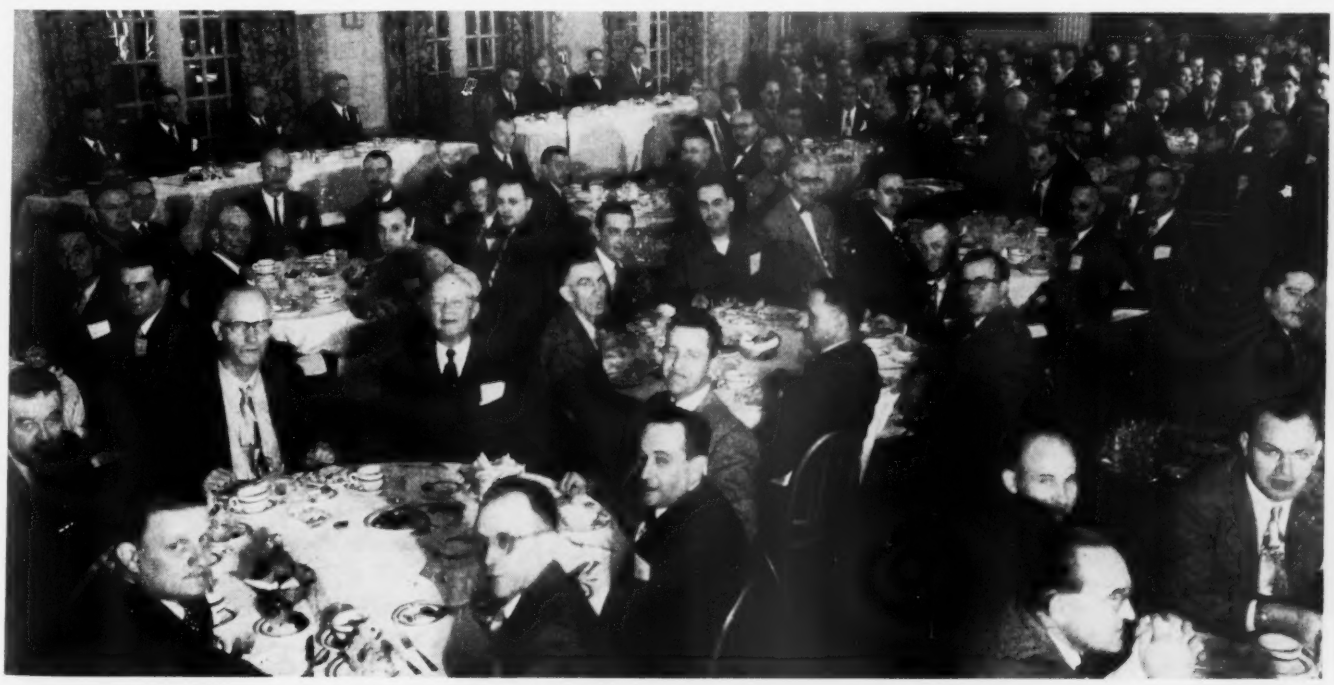
The objective, Mr. Madacey declared, is to produce quality cores in quantity at the lowest possible cost. The problem is how to do this, but the first requisite is to have technical control. However, what is modern procedure in one coreroom often cannot be modern in another because of divergent conditions and requirements. Coreblowing is without argument the most modern production method, but to produce in this manner large volume need must exist.

Caterpillar Tractor started to blow cores 18 years ago, the speaker said, and through study and experience has developed its procedures to a high state of efficiency. In general, metal coreboxes are most desirable. Among numerous factors involved in core blowing are the sand, its moisture and grain size; co-operation of every department in the foundry; mold changes when necessary; corebox design; air pressures in blowing; and handling equipment.

In answer to a question during discussion, Mr. Madacey stated emphatically that Caterpillar does not use kerosene or any other release agent in its core sand to facilitate removal of cores from their boxes. Kerosene, he maintained, cuts core oil and therefore would be detrimental to the cores.

For the second day's luncheon, Col. W. W. Warner, commandant, Rock Island Arsenal, Rock Island, Ill., was the speaker and he outlined in some detail "The Arsenal's Role in National Defense." He was introduced by Conference Chairman Matheson.

At the outset, Col. Warner explained that the Ordnance Department currently has an appropriation of $15 to $20 billion which must be spent promptly to provide the necessary national security. The Rock



General views of the banquet at Quad City Regional Foundry Conference. Col. Jack Major was the principal speaker

Island Arsenal's assignment is to provide such materiel as gun carriages, field carriages, rocket launchers, and the like. It engineers the best production methods to be used by civilian contractors and subcontractors.

In building pilot models, the arsenal sometimes needs castings and usually the delivery must be pretty fast. The Colonel regretted that it is sometimes uncomfortable for foundries asked to make the castings but pointed out that time is of the essence.

The arsenal has its own foundry and frequently has developed casting procedures before contracts for the manufacture of ordnance items are placed. Thus, the arsenal is in a position to advise bidders in connection with their estimating. Col. Warner suggested that a bidder should make sure that he can produce the job before bidding.

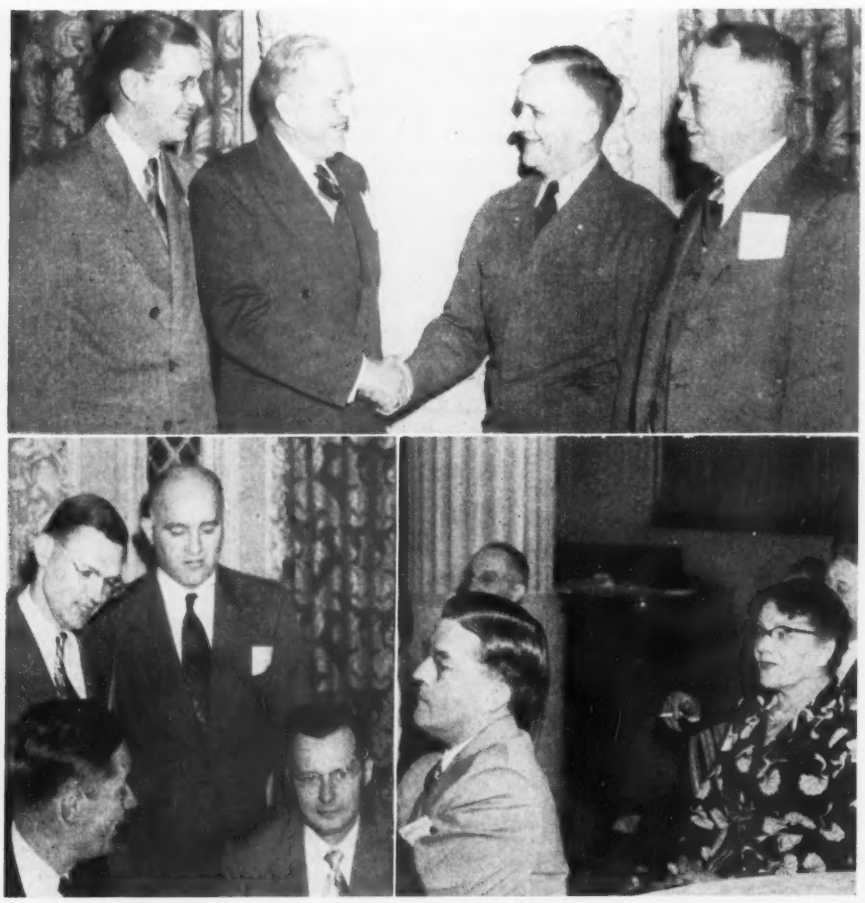
The speaker invited co-operation of foundrymen in improving manufacturing procedures and suggesting new methods. He illustrated this point by referring to the Ordnance Department's experience with the 3.5-inch bazooka. At the outset, this weapon was made from aluminum tubing and involved time-consuming attachment of certain components. After Korea, when rapid production became a matter of greatest urgency, a foundry suggested a way to make the bazooka by aluminum die casting.

Another challenge Col. Warner threw out was that weight reduction in ordnance is a difficult problem but an important one because transport sometimes must be made by air.

Perhaps the most provocative session of the conference was one in which John B. Caine, foundry consultant, Wyoming, O., posed the question "What Do We Know About Sand?" Chairman of this session was E. C. Zirzow, technical service manager, Werner G. Smith Inc., Cleveland.

Mr. Caine headed out by saying "we know nothing about sand, but unfortunately we think we know something. We have been making tests at room temperature, not at the temperature a casting is poured." Needed, he declared, are "casting tests" which include "why tests" and "time tests." The "why tests" will show why sand behaves as it does, and the "time tests" will throw light on moving molten metal longer. Necessary then will be an evaluation of the "casting tests." Only after this, can we make room temperature tests and provide control. "The whole thinking has been wrong end to," he emphasized. Continuing, Mr. Caine said we must make a simple, reproducible casting thousands of times, varying one thing at a time to get evaluation.

Sand burns on castings are caused by mechanical metal penetration in the sand surface of the mold. It is this penetration that makes cleaning difficult. "Let's talk penetration and not burn-on," he suggested. Variables in penetration are voids, temperature (sand temperature and metal superheat temperature), and pressure. The latter is a major variable. In addition, there are several minor variables.



Additional conference views. At top, left to right, are: W. C. Bell, Frank Foundries Corp., Moline, Ill., chairman, Quad City Chapter of the AFS; W. L. Seelbach, national AFS president; Col. W. W. Warner, commandant, Rock Island Arsenal, and A. D. Matheson, French & Hecht Division, Kelsey-Hayes Corp., Davenport, Iowa, conference chairman. Bottom left, front row, left to right: J. B. Caine, foundry consultant, Cincinnati, and Boyd Hays, Union Malleable Iron Works, East Moline. Standing: R. P. Schauss, Werner G. Smith Inc., Chicago, and Eric Welander, Union Malleable Iron Works, East Moline, program chairman. Bottom right: Mrs. Rose Teufel, French & Hecht Division, Kelsey-Hayes Corp. Photos by W. K. Hunt, John Deere Harvester Works

Describes Pouring Boxes

Final paper of the conference was on "Gating and Risering," with Robert P. Schauss, Chicago manager, Werner G. Smith Inc., as the speaker. Boyd I. Hays, manager, Union Malleable Iron Works, East Moline, Ill., was chairman of this session.

Mr. Schauss observed that cut-and-try methods of gating and risering are going out the window. Technical societies are standardizing on the approach to the subject and much information has accumulated. The object is to create a system of gates and runners that will introduce metal to the mold cavity at the correct rate, provide temperature gradient, and feed properly.

Scabbing, he said, sometimes is attributed to gating when it is in no way responsible. The trouble may be due to pouring rate. The gate should have a choke effect. He mentioned the various types of pouring boxes and said the idea is to get the box full as quickly as possible to allow slag to float out.

Mr. Schauss was asked why pouring boxes are used when they reduce yield, and he answered that in some cases they seem necessary because of poor pouring practice.

World Interest to SPOTLIGHT...

F A S

INTERNATIONAL FOUNDRY CONGRESS AND SHOW

Whether you attend the A.F.S. International Foundry Congress and Show as a visitor, or whether your firm exhibits in the industry-wide Foundry Show, you can be sure of one thing . . . you will find the most influential elements of the foundry field gathered under one roof for a seven-day meeting that will attract the interest of the entire foundry world.

The appeal of this International Foundry Congress and Foundry Show stems from not one but, rather, the correct combination of events . . . technical sessions, round-table meetings, division luncheons and dinners, social events and hundreds of foundry product and service exhibits that will reflect the latest developments pertaining to modernization and economy of production in the foundry.

Technical sessions and exhibits complement each other—one tells the industry how the newest developments pertaining to cast metals are accomplished, the other shows industry equipment most adaptable for economy, efficiency and speed of operation in making these developments practical every-day applications.

Here is a combination, therefore, that benefits an industry—a "team" that keeps the products of that industry in a position to compete in today's market and to figure prominently in tomorrow's progress. Being a part of such a winning combine through participation in the A.F.S. International Foundry Congress and Show is your bid for progress and industry recognition.

"EVERY Foundry in '52" will BE THERE!

Atlantic City—May 1-7, 1952

AMERICAN FOUNDRYMEN'S SOCIETY

616 SOUTH MICHIGAN AVENUE
CHICAGO 5, ILLINOIS

Industry BRIEFS

MORRIS BEAN & CO., Yellow Springs, O., has leased a plant at Cedarville, O., for production of magnesium and iron castings. In addition to foundry facilities the Cedarville plant will contain a machine shop, fitting department, pattern shop and laboratory.

* * *

Independent Foundry Supply Co., Los Angeles, recently moved into new and larger quarters at 6463 East Canning St. The company, established 20 years ago, handles foundry supplies and equipment. Carl D. Jackson is partner and general manager. Jack M. Crawford is sales manager.

* * *

Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N. Y., has completed construction of a new wing, housing two research laboratories for the development of new welding alloys utilizing fewer critical metals and for research on joining new metals such as titanium.

* * *

Charles H. Besly & Co., Chicago, manufacturer of grinders and taps, has transferred its industrial supply division to Barrett-Christie Co., which will occupy Besly's former offices and stock rooms at 118 North Clinton St. The Besly Cutting Tool Division will establish local stocks and Chicago area sales headquarters at 184 North Wacker Dr. Executive office and abrasive sales headquarters will be moved to 20 North Wacker Dr. The national sales organization for grinders and cutting tools will be established at the Besly factory, Beloit, Wis.

* * *

Reed Roller Bit Co., Cleco Division, Houston, Tex., has appointed the following distributors: W. S. Ehrenfeld Co., 531 West King St., York, Pa.; Hillsman Equipment Co., Melrose Park, Ill., and R. W. Hudgins & Sons, 1-3 Commerce St., Norfolk 10, Va.

* * *

Locomotive Finished Material Co., 319 South Third St., Atchison, Kans., has purchased a 54-acre plot of land on Sixth St. SW, Cedar Rapids, Iowa, and plans construction of an electric steel foundry to produce carbon and alloy steel castings.

* * *

Beerman Tool & Instrument Corp. has been incorporated at Albany, N. Y., to do foundry and machine tool work. Directors are David Sloane, Clara Napper, and Annette Birnbaum, 160 Broadway, New York.

* * *

Minneapolis-Moline Co., Minneapolis, has been awarded a contract for reactivation and operation of a government-owned shell plant at Brighton, Minn. The reactivation and equipment contract alone comes to approximately $2 million. Plant will be managed by W. C. MacFarlane Jr., company vice president.

* * *

Dayton Steel Foundry Co., 1366 Miami Chapel Rd., Dayton 1, O., has prepared a recently acquired plant at Portsmouth, O., for production of brake drums. However, the plant is not yet in production. An item in this department for December erroneously stated that production had begun.

* * *

Spencer-Harris Machine & Tool Co., Gladewater, Tex., has purchased Magnolia Machine & Foundry, Magnolia, Ark. Operations at Magnolia will be under the direction of Lloyd Gelvin, manager; A. L. Polaski, shop foreman, and Curtis Williams, field representative.

* * *

Newaygo Foundry, Newaygo, Mich., owned by Howard Ellmore and Walter Klaus, who also own a foundry and machine shop in Montague, Mich., is producing gray iron castings under supervision of William Buller.

* * *

Baker-Raulang Co., Industrial Truck Division, 1250 West 80th St., Cleveland 2, has appointed W. T. Billard Inc., 734 East Third St., Los Angeles 13, as representative in southern California and Arizona.

* * *

National Alloy Steel Division, Blaw-Knox Co., Blawnox, Pa., plans extension of the main foundry building, installation of additional molding and centrifugal casting equipment, and improved shop layout.

* * *

Ford Motor Co. of Canada Ltd., 2780 Sandwich St. East, Windsor, Ont., plans expansion of its foundry and machine shop. Additional plans call for construction of an automobile assembly plant at Oakville, Ont.

* * *

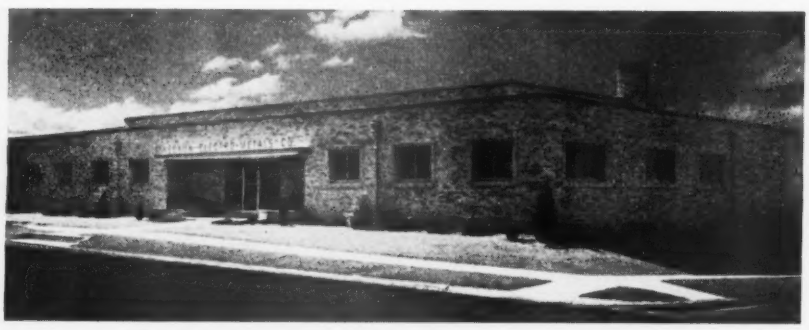
Hillman Foundries Inc., has been incorporated at Dover, Del. Corporation Trust Co., 100 West Tenth St., Wilmington, Del., is serving as the principal office.

* * *

Peerless Pipe & Foundry Co., West Thirteenth St. & Parkwin, Anniston, Ala., suffered fire damage estimated at between $25,000 and $30,000, Nov. 20.

* * *

Fox Foundry Co., 611 Fifth St. NE, St. Cloud, Minn., lost its main building in a fire Nov. 3.



NEW OFFICE BUILDING recently was completed by Keokuk Electro-Metals Co., Keokuk, Iowa. Designed to be useful and comfortable as well as attractive, the fire-proof building contains about 8500 sq ft of floor space. The producer of silvery pig iron is celebrating its 36th anniversary

THESE SNAGGING WHEELS ARE EXTRA RUGGED... ... A BOON TO YOUR PRODUCTION!

Today's vital need, conservation of men and materials, calls for increased safety and efficiency. BAY STATE abrasive products for all snagging operations are "built" to meet such demands. They are rugged . . . fast-cutting . . . efficient . . . extra safe.

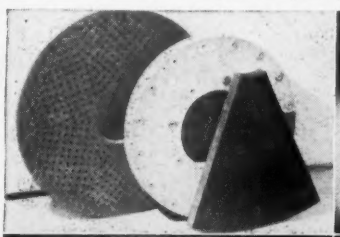
Ask for BAY STATE'S "on the spot" engineering help on your next abrasive problem.

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

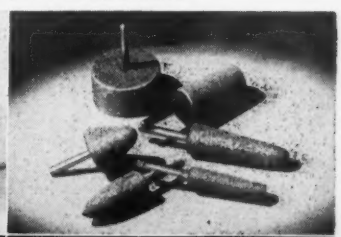
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario

BAY STATE ®

Other great BAY STATE products for foundry use.



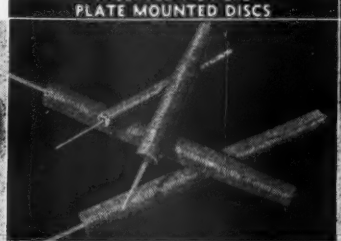
INSERTED NUT and PLATE MOUNTED DISCS



MOUNTED POINTS

CUT-OFF WHEELS

REINFORCED DISC WHEELS



CORE FILES

CUP WHEELS • CONES

BAY STATE OFFERS A RUGGED LINE FOR STEPPED-UP PRODUCTION

NEWS VIEWS

▲ **QUARTER CENTURY:** Howard W. Easton, machine assembler at the Pangborn Corp., Hagerstown, Md., receives a gold watch from Thomas W. Pangborn, president, at the first annual dinner of the company's Quarter Century Club. Seventy-seven other Pangbornites with over 25 years' service were honored. Mr. Easton, with the firm 37 years, is topped in his service record only by Victor F. Stine, vice president, with 39 years.

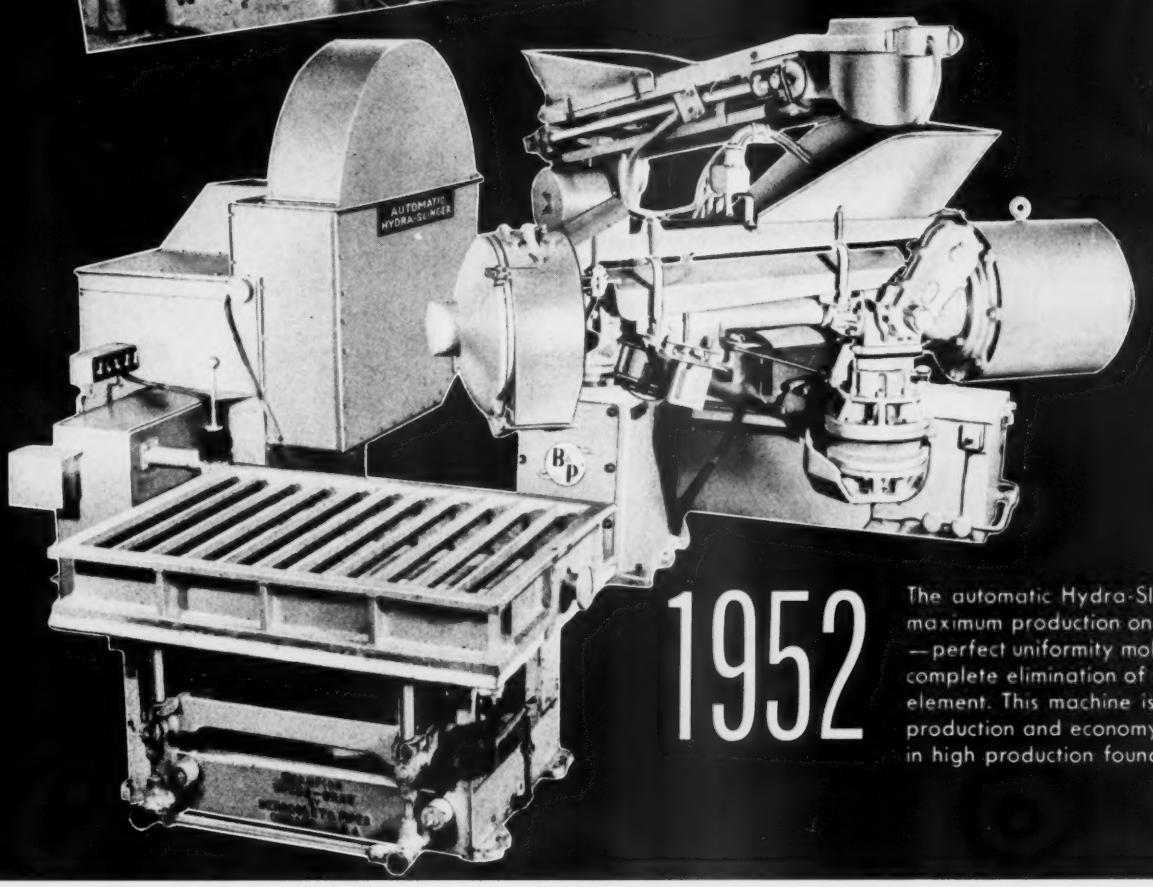
▲ **GOLD KEYS:** As tokens of 50-year membership in the Franklin Institute, Philadelphia, gold keys recently were presented by Richard T. Nalle (far right), institute president, to (left to right) Gano Dunn, president, J. G. White Engineering Corp.; William E. Moore, chairman, Pittsburgh Lectromelt Furnace Corp., inventor of the Rapid Lectromelt furnace and president, W. E. Moore & Co.; and James M. Caird, civil engineer.

▲ **SCRAP CONFERENCE:** Members of the scrap industry and Air Force disposal officers recently held a two-week conference at Dayton, O., to acquaint the Air Material Command with efficient methods of salvaging scrap materials at Air Force installations. One visit during the conference was to the Hamilton Foundry & Machine Co., Hamilton, O., where part of the group, shown here, hears Don Judge, Hamilton chief engineer, explain that company's scrap requirements.

← **65 YEARS:** Retiring after 65 years of service with the National Malleable & Steel Castings Co., Cleveland, Henry M. Oehling receives best wishes from Vice President Walton L. Woody at the eighth annual meeting of the Naco Service Society. Left to right: Chester Lewis, Mr. Oehling, Mr. Woody and George J. Leroux.

One of the very early "portable type" Sandslingers. It was moved by crane from job to job. Men shoveled sand from a heap into the rear of this slinger.

35 YEARS OF PROGRESS WITH THE FOUNDRY INDUSTRY!



1952

The automatic Hydra-Slinger for maximum production on repetitive jobs—perfect uniformity mold after mold—complete elimination of the human element. This machine is setting new production and economy records in high production foundries.

In the 35 years since the first Sandslinger was placed in operation, thousands of Sandslingers, Swingslingers and Speedslingers have been installed in foundries the world over. These machines have revolutionized foundry molding practice!

A continuing program of research and development has resulted in improvement after improvement in slingers. Mobility, higher capacity, hydraulic control, automatic operation—each innovation foundry developed, foundry tested and foundry approved.

And in these past 35 years, Beardsley & Piper has introduced many other better methods. The Speedmullor and the Mulbaro have revolutionized sand mulling. Low cost sand preparation has been made possible with the Screenarator, the Nite-Gang, the Preparator and Combination Sand Conditioning and Mulling Units. In addition, many other B&P products—Plate Feeders, Turntables, Gyratory Screens and Roller Riddles—are helping to speed foundry operations.

IN 1952, AS IN 1917, LOOK TO

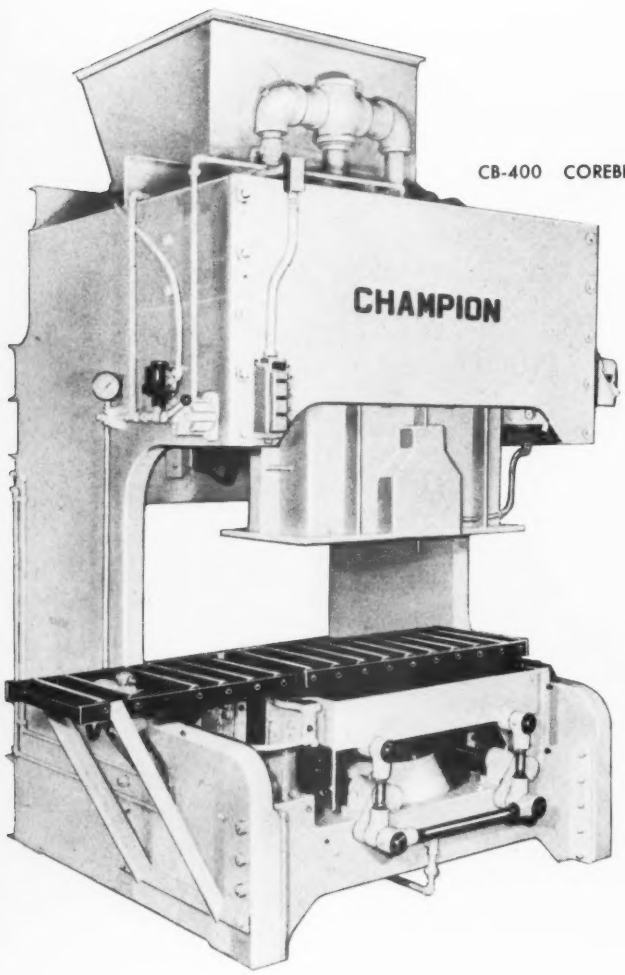
BEARDSLEY & PIPER

FOR BETTER METHODS

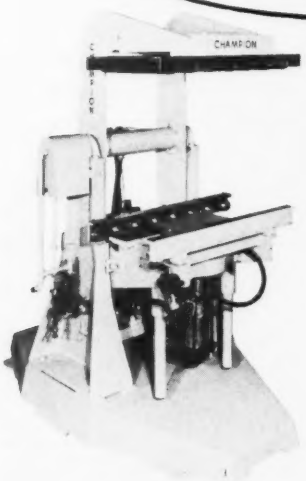
35 YEARS OF PROGRESS!

AND NOW, IN 1952, BEARDSLEY & PIPER OFFERS

COREBLOWERS
MOLDING MACHINES
ELECTRIC RIDDLES



CB-400 COREBLOWER

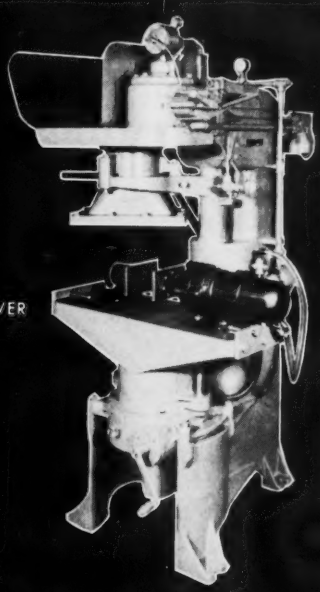


Type CR CORE ROLLOVER

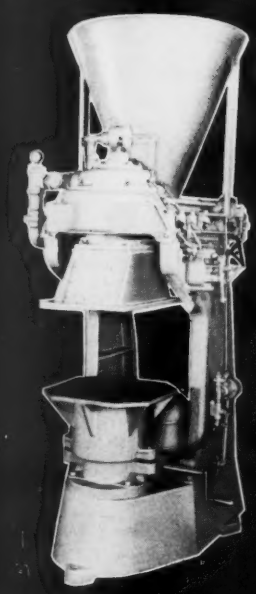
Type R ELECTRIC SAND RIDDLE

Now, a complete line of coreblowers—every one proven in hundreds of foundries—every one offering *Champion* performance. A size and type for every core blowing requirement. From the newest small CB-5 to the huge CB-400, every B&P Champion offers the same unequalled, safe, simple, speedy operation. Whether you choose *Blomatic* automatic control or standard control—it will pay you to Championize your core room. Champion Core Rollover Machines, Jolt, Jolt-Rollover, Jolt-Squeeze and Jolt-Squeeze-Pin Lift Molding Machines, and Electric Riddles are built to the same exacting standards as the world renowned Champion coreblower.

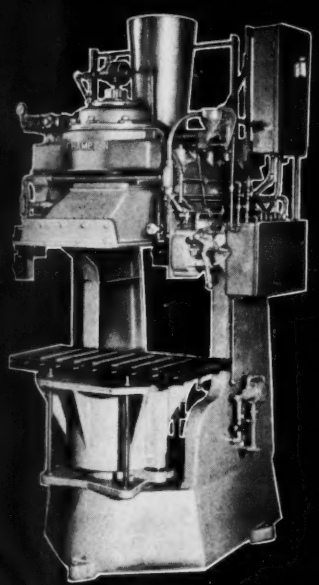
...the established CHAMPION line



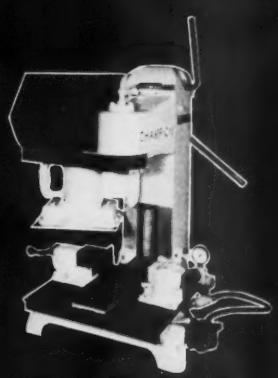
CB-10 COREBLOWER



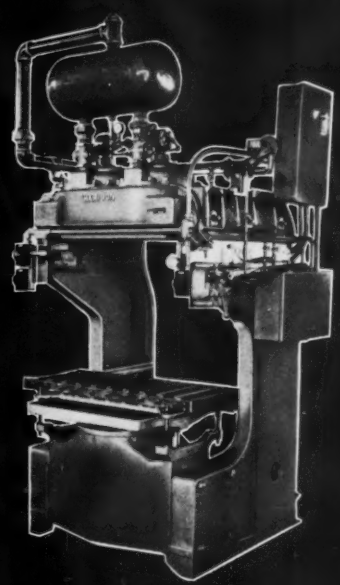
CB-12 COREBLOWER



CB-15 *BLOMATIC* COREBLOWER



CB-5 COREBLOWER



CB-18 *BLOMATIC* COREBLOWER

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FOR BETTER METHODS

35 YEARS OF PROGRESS!

THE WORLD'S MOST COMPLETE LINE OF FOUNDRY MACHINERY!

1917 → 1952

The first Sandslinger bulletin—it described a machine destined to revolutionize the foundry industry.

Here are some of the bulletins showing the world's most complete line of foundry machinery—describing equipment for sand preparation and conditioning, mold ramming and core making . . . now including the established line of Champion Coreblowers, Molding Machines and Electric Riddles. Copies of any of these bulletins are available on request.

IN 1952, AS IN 1917, LOOK TO

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BEARDSLEY & PIPER
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Printed in U.S.A.

Casting in Open Molds

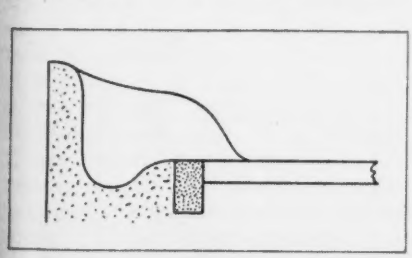
(Part II)

By PAT DWYER, *Engineering Editor, FOUNDRY*

ABC of Foundry Practice

AFTER the bed for the open sand mold has been prepared—as described last month—subsequent proceedings, in case it is desired to make a plate casting, require more or less skill on the part of the molder. Skill needed depends to some extent on whether or not a pattern is available. If a pattern is furnished it is a relatively simple matter to lay it on the bed and bank sand all around it. Usually it only is necessary to tramp the sand with the feet. When the thickness of the plate exceeds 2 in., it is advisable to use the butt rammer.

In either case the superfluous sand is scraped flush with the upper surface of the pattern. After the runner basin has been built the pattern is removed. For small plates the sand is banked up and patted firmly with the hands to form the pouring basin. If a large amount of metal is to be poured, pieces of brick or pig iron are incorporated in the sand to reinforce the back and sides of the basin. A row of long nails driven into the sand at the edge of the basin before drawing the pattern will prevent the sand from *washing* under the force of the metal stream flowing into the mold. Alternatively, the edge may be a brick, or a dry sand core, as shown



in the accompanying illustration.

Many geometrically shaped plates can be made without the aid of a full pattern. The only pattern required for making a round plate is a short segment piece the thickness of the desired plate. The outside face is cut to form an arc of the circle. The approximate center of the sand bed is found by laying a straightedge first from two diagonally opposite corners and then from the other two corners. Two short lines are scribed in the sand where the lines cross. A wood wedge is driven into the sand where the two lines cross each other. A pair of trammels is set to the required radius, allowing ⅛ in. per ft for contraction. One point of the trammels is set on the wedge and the other point is used to scribe a circle on the bed. The pattern segment is placed with the outer edge coinciding with the scribed line and a piece of pig iron or other suitable weight is placed on the segment to hold it in place. Sand is shoveled and rammed against the pattern. The segment is moved around until the circle has been completed.

A square or rectangular plate can be made with a single straightedge. Outline of the plate is marked on the bed by using the straightedge as a guide and a carpenters steel square for defining the 90-degree corners. The straightedge, or if necessary a thicker piece, is placed to coincide with the scribed line. Each side is banked with sand as in the preceding instance. Laying out the lugs on a lifting plate or defining the position of certain points on the surface is done easily if a few simple rules are observed.

The fact that the radius of a circle may be used to divide its circumference into six equal parts is taken advantage of in many ways when laying out certain definite points on a circular open plate. For instance, if six holes are required spaced equidistantly, it is only necessary to scribe a circle the required distance from the center and then step the trammels around on this circle. Similarly, if three equidistant points are needed, every alternate one of the six marks is selected. If twelve points are desired, each of the six spaces may be subdivided.

To lay out the position of the four lugs usually provided on a circular lifting plate, a long straightedge is laid on the bed, with one edge passing directly over the center mark. With the point of his trowel the molder makes a mark where the edge of the straightedge rests on the outer circle. The straightedge then is lifted and set down again at right angles to the marks just made. A steel square is employed for the purpose. The edge, of course, is held closely to the center as in the first instance. A mark scribed in the sand alongside the straightedge will be at right angles to the first line. The points where it cuts the circumference will be equidistant from the marks already established.

When setting the blocks designed to form the lugs it is optional whether the center of the block is placed over the mark or whether one side of the block coincides with the mark. If the second alternative is adopted, be careful that the block is set in the same relative position at each mark. Thus if the block is set at the right side of the first mark, it must also be set on the right side of each of the remaining marks.

When the size and shape of the lugs and handles are to conform to a definite standard, it is necessary to provide a block of the desired shape. In ordinary foundry practice where this feature is of little or no importance, one or two common bricks may serve as patterns. They are rough, but they may be rapped sufficiently to enable the molder to lift them out of the sand after they have served their purpose. On many large plates, especially those used in loam molding, it is customary to dispense altogether with wood segments. A dozen or more bricks are set with the outside edges coinciding approximately with the circle marked on the sand bed. Sand is banked and rammed against them, after which, if necessary, they are moved to a new position and the operation continued until the entire ring has been enclosed. The bricks then are removed.

In many open sand plates it is necessary to provide openings for various purposes. If intended merely as vent holes, pieces of coke or scrap cores are pushed into the face of the sand bed. They are left protruding above the bed a sufficient distance to insure that the molten iron will not cover them. They are pushed into the sand a sufficient distance to anchor them firmly and preclude the possibility of their being dislodged either by the force of the metal stream entering the mold, or from their own buoyancy when immersed in molten metal.

When holes of a definite shape and size are wanted, the position first is marked on the bed and then the necessary cores, either green or dry sand, are placed. If dry sand cores are employed and merely set in position on the sand bed, it will be necessary to place a small weight on each to prevent it from floating away

when the mold is filled with iron. If an open frame corebox is available, green sand cores are preferred. The frame is placed over the space to be occupied by the core. It is rammed full of sand. In some cases it may be advisable to drive a few nails, rods or soldiers to anchor the core to the bed. In many instances this precaution is not necessary.

A moment's reflection will convince any person that there is a vast difference between preparing a bed for an open sand plate and preparing a bed for a mold that is to be poured under a cope. The open sand bed has to support only the weight of the thickness of iron lying on top of it. The bed of a closed mold has to support the weight of the iron lying on it multiplied by the height of the pouring basin. A plate 12 in. square, 1 in. thick will exert a pressure of 12 x 12 x 0.26, or 37.44 lb on an open sand bed. The same plate would exert a pressure of 12 x 12 x 0.26 x 6, or 224.64 lb on the bottom of a mold covered by a cope 6 in. deep.

For the foregoing reasons it is evident that the bed of a closed mold must be much harder and firmer than a corresponding bed for an open sand mold. The soft sand under the face of an open sand mold is open and porous enough to conduct the steam and gas away from under the iron without the aid of artificial venting. On account of the increased density of the sand under a closed mold, the bed must be vented with a wire and provision made underneath to carry away the generated gases.

The usual procedure is to lay a cinder bed connected to the atmosphere either by one or more pipes when the mold is made in the floor, or by suitable channels between the lower edge of the drag and the bottom board or plate when the mold is made in a flask. Assuming that the cinder or coke bed comes to within 4 in. of the mold face, floor sand is shoveled in to that depth and tramped off. This will lower the sand about 1 in. The face is gone over with a vent wire, making sure that the point of the wire reaches the cinders each time it is driven down. Facing sand to a thickness of 1½ in. is spread over the bed and tramped down lightly. A long straightedge with the ends resting on opposite sides of the drag, or on two straightedges, depending on whether the mold is made in a flask or in the floor, is employed to scrape the facing sand to a flat, even surface.

Pattern Rapped Down

If necessary, small excavations are scooped in the bed to accommodate any projections on the face of the pattern. These depressions are lined with facing sand to approximately the correct shape. The pattern is lowered into place and rapped all over to secure a firm impression. It may be necessary to lift the pattern out again and add a little facing sand here and there to fill any soft spots. The pattern then is returned. Ramming of the remainder of the mold is carried out in the usual manner.

In earlier works on foundry practice it has been pointed out that the vent wire should not be used until after the facing sand had been tramped down and scraped off. The holes then are stopped with the finger and a small quantity of facing sand. This is a time-consuming process and is not necessary. It may be necessary where an extra fine grade of sand is employed. Shops engaged in making large castings usually work with an open grade of sand. If they do not, it will pay them handsomely to secure a supply. Except for fine, light castings a fine grade of sand is a delusion and a snare.

(To be concluded next month)

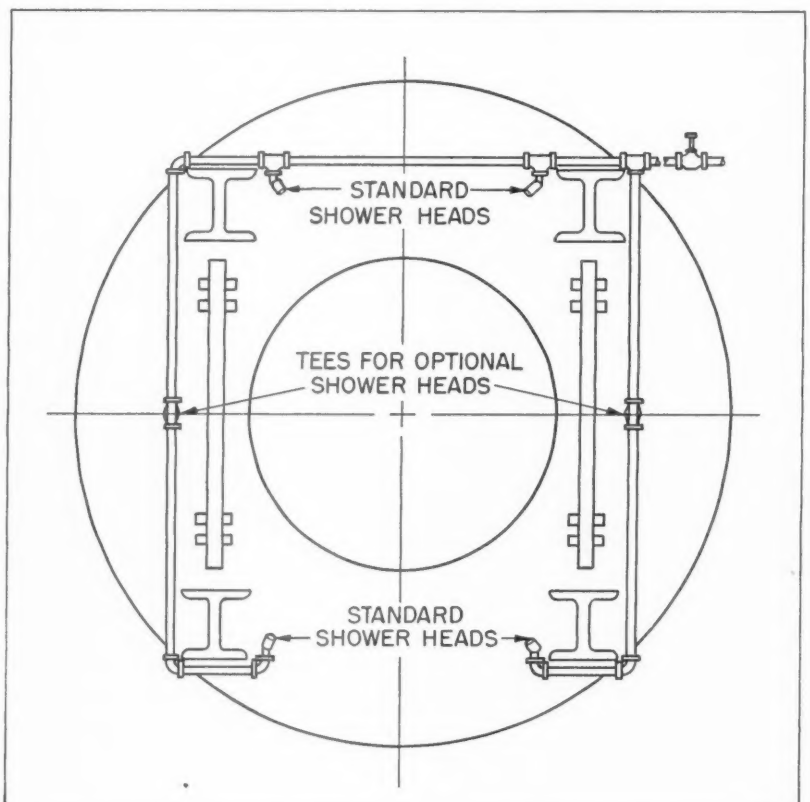
Water Spray Quickly Cools Cupola Drop

By D. W. HARRIS, Frank Wheatley Pump & Valve Mfr., Tulsa, Okla.

A RECENT simple installation in our foundry provides a marked improvement over the method commonly employed to quench the cupola drop at the end of the day's heat. Formerly when the cupola bottom was dropped an attendant stood by with a hose or bucket to cool the burning coke, slag, and over iron.

The device, tied into the existing water line, consists of a square loop of ½-in. standard pipe and fittings around the cupola shell, with a shower head at each corner. Four brackets were welded to the cupola legs to mount the piping. All material, except the shower heads, was salvaged from the yard pile; shower heads were salvaged from a dismantled washroom. The complete installation was made by the cupola tender at odd times.

The piping is placed as close as possible to the cupola bottom plate. This eliminates interference with the swinging bottom doors. Another reason for mounting the piping as high as possible is to direct the spray downward and thus prevent any water from coming in contact with the brick lining. Height from the floor depends on the length of the cupola legs. In this case the piping is 4 ft from the floor. The drop from under the cupola is removed the morning following a heat.

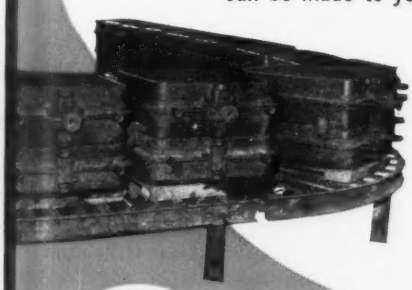


How READING GRAY IRON discovered BS&B FOUNDRY FLASKS cut casting costs

Continuous production of gray iron castings calls for foundry flasks that can "take it" without being so heavy that they slow up production. Reading Gray Iron Castings, Inc. found BS&B medium duty Foundry Flasks their answer—the lightest weight flasks at the lowest ultimate cost. After comparing maintenance, repair and replacement (as well as the preference of the molders) with other flasks, Reading has standardized on BS&B throughout in its modern, high grade jobbing foundry at Reading, Pennsylvania.

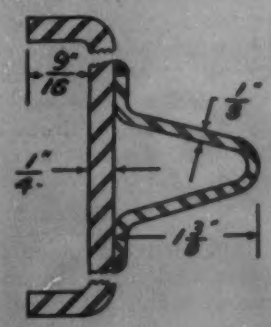
BS&B fabricated steel Foundry Flasks feature a construction that is pound-for-pound stronger. The flasks are fully welded throughout and fabricated for maximum strength and service life. The bearings are of sufficient width to help maintain rigidity and formed cold from full-gauge steel plate to prevent warpage and deformation under hard and constant use. As a result BS&B flasks have the ultimate lowest cost to the foundry—and require fewer "standby" flasks to replace flasks being repaired.

BS&B flasks are made in round, square and rectangular shapes for light, medium or heavy duty. Pinlugs, available in all styles, are standard equipment and can be had in any arrangement or combination you desire. Special flasks can be made to your specifications.



Write today for your free copy of the BS&B Foundry Flask Catalog—a most useful foundryman's handbook with complete diagrams, specifications and tables.

MEDIUM DUTY FLASK
STYLE FP16R



Cross section of BS&B medium duty flask, showing wall thickness, sandstrip width, and depth and thickness of specially formed channel rib. Minimum depth of sections is 3".

FOUNDRY BS&B FLASKS

BLACK, SIVALLS & BRYSON, INC.

DEPARTMENT 7AR1 — 7500 EAST 12TH STREET — KANSAS CITY 3, MISSOURI

By EDWIN BREMER

Foundry DEVELOPMENTS

INVESTIGATION of cast iron fluidity by E. R. Evans—reported in *Journal of Research and Development,* October, 1951—led to development of a carbon equivalent value for fluidity, CEF = TC + Si/3 + P/2, to reconcile differences between high and low P irons so that at any temperature all irons of the same CEF value possess the same fluidity and practically the same solidification temperature. It was found that if fluidity is based on the solidification temperature, high-C, low-P irons possess slightly better fluidity than other irons of the same CEF value. Fluidity of all cast irons is apparently independent of Mn content within the range 0.5 to 2.5 per cent. S content up to approximately 0.20 per cent has no effect on fluidity, but above that figure there is a slight increase in fluidity at lower temperatures and a marked decrease at higher temperatures. Ni up to 5 per cent and Cu up to 2 per cent increase the fluidity of low P irons, whereas Cr up to 4.5 per cent reduces fluidity.

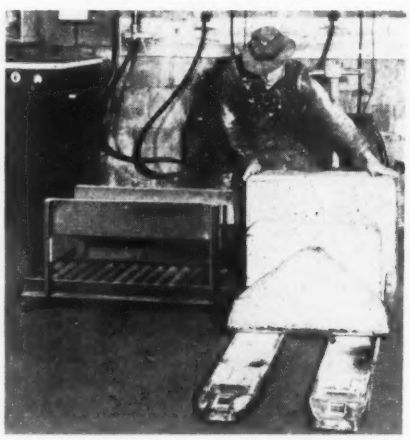
These fluidity variations can be explained entirely by corresponding variations in solidification temperature. In small quantities the following special alloying elements can be said to have no effect on the fluidity of low or high P irons containing 3 per cent C and 2 per cent Si: Ni, Cu, Cr, Mo, Ti, V and B. Irons inoculated with FeSi show no variation in fluidity from that of irons of the same composition which have not been inoculated.

* * *

ACCORDING to one authority, experimental work conducted on the use of highly exothermic compounds in risers of copper and copper-base alloy castings did not lead to favorable results. It was reasoned that the high heat developed by the exothermic material and the high thermal conductivity of copper and its alloys caused the trouble; the heat was carried down into the casting itself, producing dendrites which result in a plane of weakness, shrinkage and often leakage. From an economical viewpoint insulating sleeves will do as much if not more for nonferrous castings in regard to yield as the highly exothermic type of material does for iron and steel castings.

* * *

INGENIOUS idea for handling industrial truck batteries, according to Gould-National Batteries Inc., eliminates lifting and use of an overhead crane. Home-made, four-wheel battery cart developed by Distribution Terminal Warehouse, Cleveland, shown in the accompanying illustration, uses a 4-foot section of roller conveyor as the bed which permits the batteries to be rolled on or off the cart. Casters are secured to each



corner of the conveyor section so that it rolls freely on the floor. Structural angles are welded perpendicularly at each corner of the conveyor section, and 2 x 8-in. planks are bolted across both sides and one end. Similar plank on the other end is removable. Use of one carrier for each truck eliminates unloading at the charging station.

* * *

APPLICATION of dual-metal casting to the production of a combination spindle and coupling box unit for a steel rolling mill stand resulted in considerable saving to the user. Previously coupling boxes and spindles were wearing out at the rate of one box and one spindle each month, and during a 6-month period replacement costs were $840. Combination unit gave 6 months' service and cost $140. In the dual-metal casting process a tough austenitic steel was cast on a plain carbon steel base, the austenitic steel being applied only to the spindle wabblers and the pods on the coupling-box end.

* * *

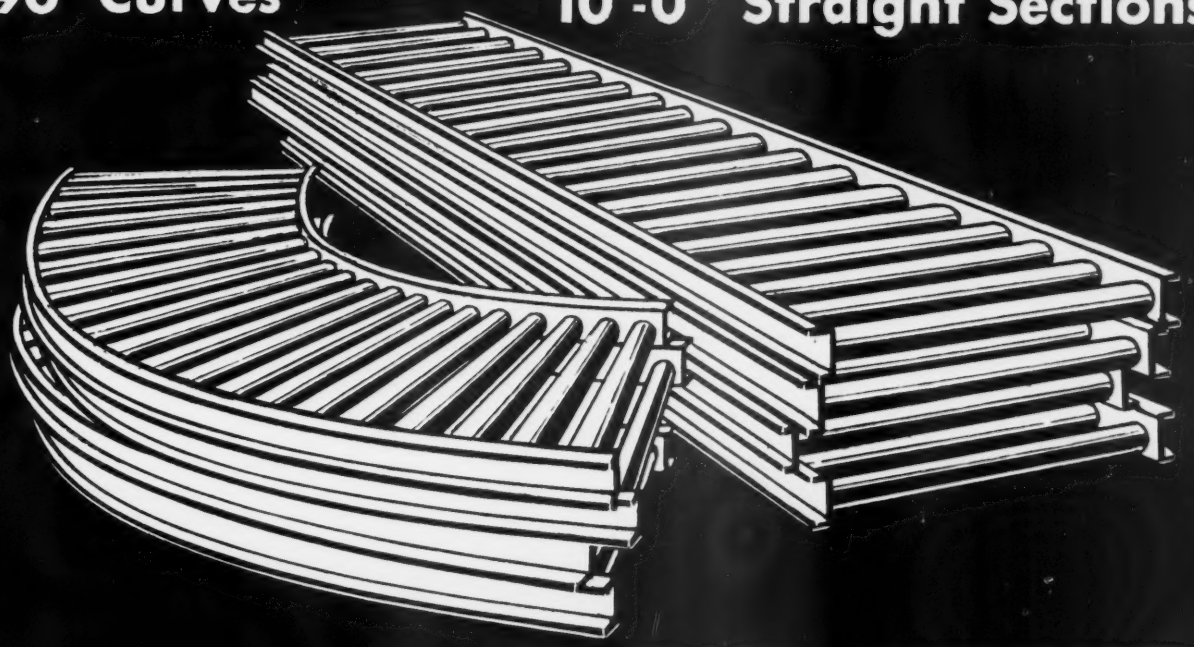
CONSIDERABLE interest appears to have been developed in application of cerium-lanthanum (misch metal) alloy to production of steel. Carpenter Steel Co. (August, 1951 issue, page 151) found that such additions to difficult-to-work high-alloy steels markedly improved their rolling and forging properties. Recently it was mentioned that the exact mechanism of misch metal in promoting hot-workability has not yet been determined, but was believed partly due to deoxidation properties of the material. It might be pointed out that Morrogh in his work with misch metal on cast iron mentions that the former is an active desulphurizer as well as a deoxidizer, and also is a powerful carbide stabilizer when the residual is over 0.02 per cent. Additionally, it should be stated that magnesium has similar characteristics, but presumably the high temperatures in steelmaking are a barrier in its addition to, and in obtaining a suitable residual of magnesium in steel. Misch metal additions to steel for castings are being studied diligently, but at the moment no results have been disclosed.

* * *

STUDY of the mechanism of grain refinement in aluminum alloys by addition of small amounts of titanium, molybdenum, tungsten and chromium by Crossley and Mondolfo, and reported in *Journal of Metals,* December, 1951, led to the conclusion that the refinement is associated with the peritectic reaction. The primary crystals of intermetallic compound which form, react with the liquid and become sheathed with a solid having the crystal structure of the phase that is going to be formed from the liquid. These solid particles act as nuclei for the crystallization of the melt, thus eliminating the necessity of undercooling to provide spontaneous nucleation. Final grain size appears to depend mainly on the number of primary crystals that form, and any factor which affects the number of these crystals will alter the grain size. Addition of Al-Ti alloys reduces grain refining effect, and effect of the grain refining agent is lost if sufficient carbon is added.

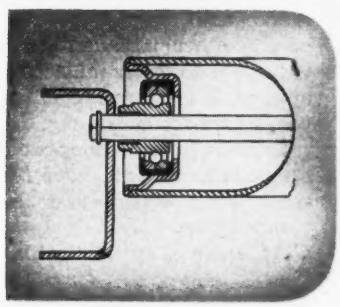
90° Curves

10'-0" Straight Sections



IMMEDIATE SHIPMENT

Stock ROLLER CONVEYOR



DETAIL OF ROLLER

How many sections do you need? Offered in several sizes for average duty conveying. Roller spacing 4" or 6" centers. Roller lengths of 12", 16" and 20". Can be used with rolls set high, or inverted so that rolls set low and frame forms a guard rail. Both stationary and portable supports available. Write for literature.

FEATURES

ROLLER—2¼" O.D. No. 16 Ga. Welded Steel Tubing. Pressed Steel cup secured to tubing. Cap. 150 lbs.

SHAFT—7/16" Hexagon Cold Rolled Steel. Positively locked against rotation by hexagon holes in frame.

BEARING—No. 50. Slip fit in cup, easily removed and replaced. Protected position—set back from end of roll.

FRAME—3½" x 1¼" x 10 Ga. Pressed Steel Channel. With four 1-5/16" O.D. 13 Ga. Welded Tubing ties per 10'-0" section. Capacity 75 lbs. per foot with supports on 10'-0" centers and 380 lbs. per foot with supports on 5'-0" centers.

COUPLING—Furnished with bolted type for stationary service. Can furnish hook type for portable service if preferred.

Check Your Needs, Today!

Logan Conveyors

LOGAN CO.
580 Cabel St.
Louisville
Ky.

Salesmen prepare to start calls on plants in search of dormant scrap

Surveys were made on the spot to determine what could be scrapped

A load of miscellaneous scrap is checked on its arrival at a yard

Racine Drive Shows

HOW TO ROUND UP SCRAP

By ERLE F. ROSS, *Chicago Editor, FOUNDRY*

ONE effective way to round up dormant iron and steel scrap was demonstrated in a one-day drive at Racine, Wis., Nov. 15. It resulted in approximately 2150 tons—54 carloads—being located and tagged for immediate shipment to mills and foundries.

During the day each of Racine county's firms employing 25 or more persons was canvassed in the search for scrap. This task was handled by a team of 25 salesmen recruited from steel producers and warehouses. The drive was conducted by the Racine County Dormant Scrap Mobilization Committee and had the backing of the Manufacturers' Association of Racine. This committee is but one of 2000 formed throughout the country to function during the scrap emergency; however, the Nov. 15 drive attracted wide attention and points the way to similar action elsewhere.

Racine is a medium-size industrial city. It has a population of about 75,000 of which over 23,500 are employed in industrial plants, majority of which produce or consume iron and steel products. Located in the county are slightly more than 100 plants employing 25 or more workers.

The alertness and co-operative spirit of the city's industry was demonstrated fully during the scrap drive. Steel salesmen reported advance publicity had paved the way for their calls, so no time was lost in completing their work.

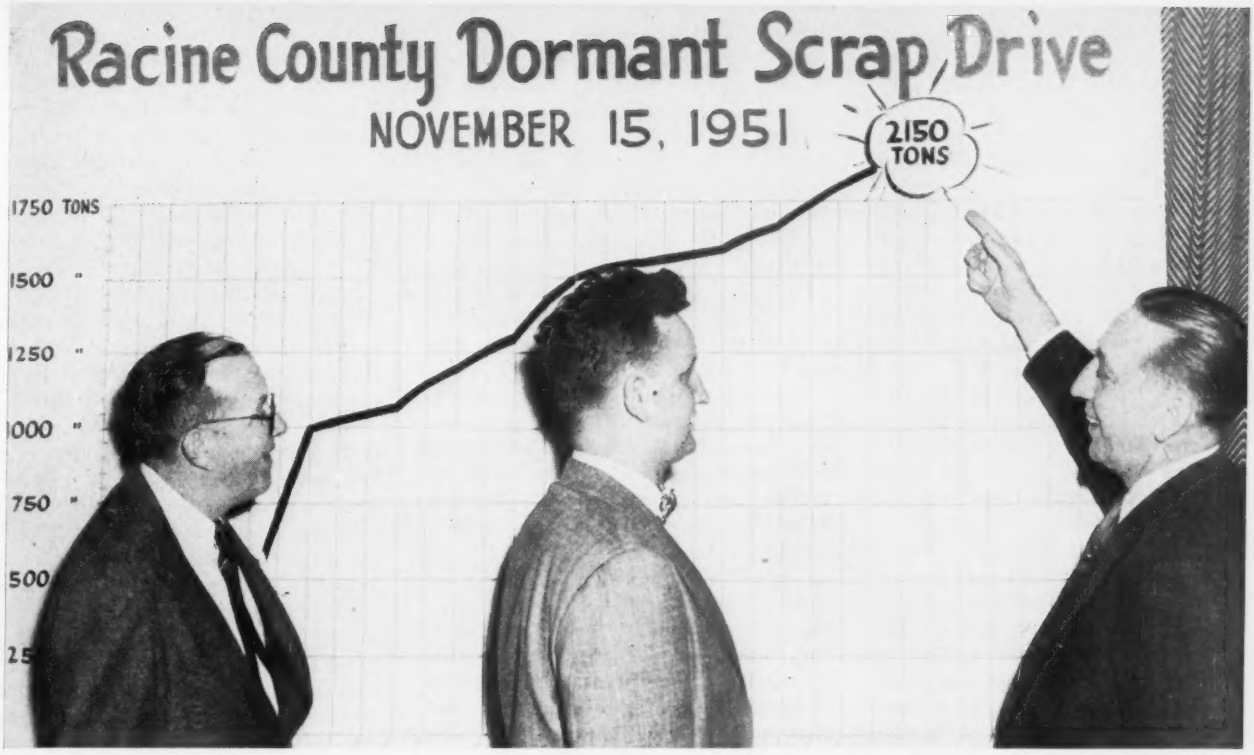
Each plant visited was asked to do three things: 1. Make an on-the-spot survey of the plant; 2. Give an estimate of the probable tonnage of iron and steel scrap; and 3. Appoint a top executive with authority to make decisions as his plant scrap chairman.

In most cases, the steel salesman was invited to tour the premises in company with the individual responsible for locating and disposing of scrap. Frequently it was found that some dormant scrap already had been disposed of, sometimes more was found and tagged for release, and in still other instances the salesman was able to offer advice and make suggestions concerning items to be considered for scrapping.

Some of the experiences of the steel salesmen will serve to illustrate what can be expected in dormant scrap drives.

At Belle City Malleable Iron Co.

Approximately 60 tons of scrap was uncovered in the form of 21 worn-out tumbling barrels at the Tractor Works of the J. I. Case Co.



Scrap drive leaders look over the results. Left to right: John Egan, Hamilton Beach Co.; C. W. Jones, John Pritzlaff Hardware Co., Drive Chairman A. O. Wolf, Hamilton Beach. The drive netted about 2150 tons

and its affiliate, Racine Steel Castings Co., Harry A. Thorson, assistant treasurer, is the buyer of cupola and electric furnace scrap. One way to assure adequate supply, he maintains, is to dispose of obsolete production equipment as promptly as possible. The problem, however, is in getting approval of the plant manager or other executives for such disposition. Sometimes these decisions are hard to make because equipment set aside today may have possible use tomorrow. Nevertheless, in the present emergency it is imperative to press for an answer to the question "Can we scrap it?"

Belle City is currently modernizing its steel foundry and is replacing much old equipment. In the two weeks preceding the scrap drive the company had, on its own initiative, collected and disposed of some 137 tons. Under pressure of the drive, another 30 tons or so was pledged, this including about a dozen obsolete molding machines, several hundred steel flasks, a few charging buckets and 6 to 8 tons of old straightening dies. R. J. Anderson, works manager, is heading up the company's scrapping program, and has not hesitated in making decisions.

Approximately 60 tons of dormant scrap was uncovered at the Tractor Works of J. I. Case Co. This was made up of 21 worn-out and obsolete tumbling barrels. According to G. Kousek, procurement department, these mills had been removed from the plant two years ago and hauled to a remote area in a large field. There they remained forgotten until

Unloading old molding machines in Silver Steel Co.'s scrap yard. Workers are torching old foundry flasks

Old machinery is inspected to determine what can be disposed of to help swell the flow of scrap to users

the local scrap drive brought them to mind. A significant quantity of old tractor wheels also was turned up and pledged for scrap at the main plant of Case. And at the same location a long unused smoke stack will be taken down and cut into scrap.

In one call upon a small plant, the steel salesman was told of a not-far-distant stone quarry where some piled-up metal appeared to be of dormant character. Judging that the quarry had not been scheduled for a check, the salesman visited the spot and struck "pay dirt." The operators admitted a small accumulation of old machinery and equipment and not only agreed to dispose of it at once but to survey the property for additional material.

Biggest pledge to the scrap drive actually was a windfall. It was a 450-ton traveling bridge which Wisconsin Natural Gas Co. used to unload coal from lake boats and move it to its old gas manufacturing plant before shifting to natural gas a year ago. The bridge was dropped to the ground the day before the drive and was being torched into scrap when the steel salesman called.

Wisconsin Electric Power Co. explained to the calling salesman a method it is using to increase collection of non-production scrap. Positioned inside the plant gates is a trailer body provided by a scrap yard. As service trucks return from their operations each day the crews throw into the body all pieces of cable, bolts, nuts, braces and broken tools that accumulate in their work. Once a week the scrap dealer picks up the load.

Arnold O. Wolf, assistant general manager, Hamilton Beach Co., was chairman of the Racine committee, and George Harper, Burlington Brass Works, was co-chairman. Serving with them were William D. Stansil, executive secretary, Manufacturers' Association of Racine; Einar A. Jacobsen, Jacobsen Mfg. Co.; Harry A. Thorson, assistant treasurer, Belle City Malleable Iron Co.; Robert M. Wadewitz, vice president, Western Printing & Lithographing Co.; and Melvin G. Ward, vice president and plant manager, Walker Mfg. Co.

LARGE FOUNDRY SHOW PLANNED

For AFS International Congress

A LARGE exhibit of foundry equipment and supplies at the International Foundry Congress and Show to be sponsored by the American Foundrymen's Society at Atlantic City, May 1 through 7, appears assured. More than 80 per cent of the exhibit space in mammoth Convention Hall already has been taken, the association has announced.

The hall, which will be headquarters for this 56th annual meeting of the AFS, also will be used for technical and business meetings during the week. Exhibits will be open for the full seven days. Sunday, May 4, is designated as International Day, and on this day, foundrymen in the area will have the opportunity to attend the exhibits without paying a registration fee. No technical sessions are scheduled for Sunday.

The pattern for the six-day technical-practical program already has been set. All divisions of the foundry industry will be represented in the wide range of technical sessions and shop courses being sponsored by the various planning committees of AFS. Papers are now being prepared for preprint releases.

Roundtable luncheons and dinner meetings will be included as part of the balanced program that will be highlighted by the Charles Edgar Hoyt Lecture.

Applications for hotel accommodations were sent to AFS members and exhibitors a month ago, and early housing requests indicate that the 1952 meeting will be well attended. Room requests are being serviced directly by the AFS Housing Bureau, 16 Central Pier, Atlantic City, N. J. The abundance of Atlantic City hotels located close to Convention Hall gives assurance of an ample number of room accommodations for all AFS members and guests.

Because Atlantic City is situated outside of a regular AFS chapter area, the official hosts for the International Foundry Congress will be the chairmen of the 40 chapters. The Ladies Committee will be comprised of the chairmen of the Ladies Entertainment Committees at the ten most recent national AFS conventions. Honorary hostesses will be the wives of past national presidents.

The 1952 International Foundry Congress, like other annual AFS meetings, will include plant visitations, apprentice contest displays, annual business meeting and lecture, presentation of AFS medals and awards, educational and related-interest displays, industry banquet, and special social events.

U.S. Experts Help French Foundries Boost Output

Eight American foundrymen have been loaned for six months to France in an Economic Co-operation Administration technical assistance project to help increase French foundry productivity. They will participate in an industry-wide productivity seminar jointly sponsored by ECA, the French Productivity Center and the French foundry industry, and then will help the industry make changes deemed necessary for increased productivity.

The specialists include: C. E. Cromwell, superintendent, Ohio Steel Foundry, Springfield, O.; Joseph Prendergast, general foundry manager, Sullivan Machine Co., Manchester, Vt.; Charles Seaman, ECA; James L. Gibney, general foundry superintendent, General Chemical Corp., Pulaski, Va.; Ralph R. West, president, West Steel Castings Co., Cleveland; Ernest Starkweather, metallurgist, Chevrolet Division, General Motors Corp., Buffalo; Clinton L. Reams, former materials handling consultant, Ford Motor Co., Dearborn, Mich., and H. E. Fellows, president, Fellows Corp., Milwaukee.

J. L. Mercer, Frank L. Crobaugh Co., Cleveland, will join the group early in January.

Meehanite Casting Design Winners Announced

Winners in its casting design contest were recently announced by the Meehanite Metals Corp., New Rochelle, N. Y. Open only to design engineers in manufacturing plants using castings, the contest was aimed toward disclosing new uses and applications of Meehanite castings and uncovering problems solved by their specifications.

Prize winners, prizes and titles of winning entries were: First prize, $500, H. D. Samuel Jr., McCulloch Motors Corp., Culver City, Calif., "Airbourne Compressor Castings;" second prize, $300, William H. Thomas, Roots-Connersville Blower Corp., Connersville, Ind., "Compressor Castings;" third prize, $150, Al Gorski, George Gorton Machine Co., Racine, Wis., "Special Pantograph Machine;" fourth prize, $100, Henry Hubbell, Fafnir Bearing Co., New Britain, Conn., "Railway Journal Housing;" fifth prize, $75, Robert E. Greenawalt, Salem Engineering Co., Salem, O., "Heat Treating Furnace Parts;" sixth prize, $50, Max M. Beasley, Cobble Bros. Machinery Co., Chattanooga, Tenn., "Rug Sewing Machine."

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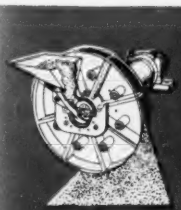
Continental Gin Co., Prattville, Alabama has found there is a big difference in cleaning room efficiency using the airless Wheelabrator. Although the tonnage of gray iron castings cleaned daily is relatively small—only 8 tons—the savings effected are worthwhile. They replaced FOUR tumbling mills with ONE 66" Wheelabrator Swing Table and cut their cleaning time in half.

The speed and versatility of the Swing Table —which will rapidly clean anything which will fit on the work table—enabled a reduction of 58% in labor. All cleaning is accomplished in 5 hours time. With the tumbling mill set-up 24 man hours were needed due to time-consuming sorting, loading and unloading operations.

Mr. J. N. Buckner, Gen'l. Supt., says he "would not trade the Wheelabrator for any other method known." It produces a cleaner product, simplifies inspection for surface flaws, improves working conditions and requires less floor space.

Like to know how this profitable difference in cleaning results can be duplicated in your foundry? Wheelabrator engineers will make a thorough survey of your problem recommending the size and type equipment for your application. Such a survey costs you nothing—and may save you a great deal.

Write or call for details today.



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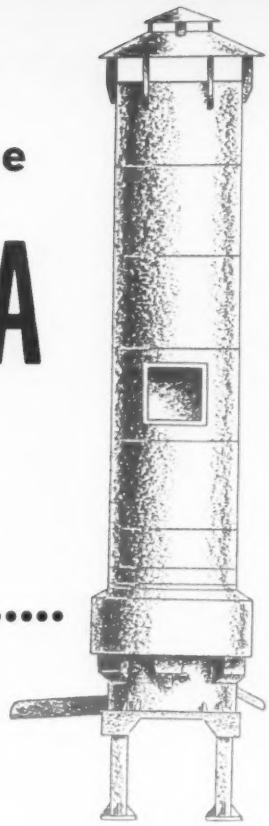
How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis



Tests for physical properties of cupola iron, and use of deoxidants, graphitizers and alloy additions are discussed in this concluding article

IN MOST instances the physical properties of cupola metal are the ones used in connection with the sale and use of the castings. In certain instances the customer may also specify chemical analysis, but his real object is to guarantee physical properties of definite characteristics.

Chemical analyses are of greater importance to the operator than to the purchaser, for they aid in controlling the limits of variations to meet certain physical specifications. Frequently the chemical analysis will not reflect the changes which occur in the physical properties which account for the customer's greater dependence on the latter. Because of this divergence between chemical and physical properties in the castings it is highly important that the producer make use of the principal tests for physical properties as well as obtain chemical analysis.

It is not possible in many shops to conduct complete physical tests because of the cost of equipment and the staff necessary to do so. It is possible, however, in most shops to conduct such physical tests as will reveal the principal factors of concern. These factors are discussed.

Chill Test—This is a simple and highly significant test which can be conducted in all plants at a very low cost and without too much time. This test, when properly conducted, is highly sensitive to the state of oxidation of the metal. In most instances the simple wedge test is satisfactory. Additionally, the wedge bar, key hole bar, or step bar may be used, depending upon the chilling tendency of the particular metal.

The core blocks for any of the above tests can be made in the individual plant, and the significance in the variations in the successive chill tests can be quickly associated with the metal from the cupola.

It is well known that when the cupola is oxidizing the chill tendency of the metal will increase, and in most instances this will precede other detectable factors.

The importance of temperature measurements has already been pointed out. With a little experience the operator reading temperatures can detect a change in the surface of the metal as he is reading temperatures. As the metal begins to oxidize, a bright oxide film develops on the metal surface. The chill will go up and frequently the pourers will report that the metal is freezing too fast on them. Under extreme oxidation the ladles will "scull" over rapidly and a "lace curtain" rim will develop all around the top of the ladle.

The chill test will detect the trend of combustion or oxidation within the cupola (other conditions constant). Additions of silicon or manganese can be used to correct the hardness or softness of the metal to bring it to the proper state to meet specification.

Hardness—In most cases the brinell hardness test of gray iron is used. Inexpensive portable outfits which can be used in almost every shop now are available. These portable units, while not as accurate as the larger stationary models, can be used as a quick guide to operating conditions and their cost is low.

This test is an excellent indicator of the machinability of the castings, a factor under discussion quite frequently between producer and consumer.

Tensile Strength—Frequently castings are sold on the basis of their tensile strength, and if so it is necessary that the foundry prepare and test the bars themselves, or send them to a commercial laboratory. This factor, of course, will tie in with the control of the chemical analysis to meet the specifications required.

The equipment necessary for this test is more elaborate than the portable brinell testers mentioned, but it is the only means of obtaining a measure of this property. Conducting the test is not difficult as the procedure has been well standardized.

Transverse Test—This test requires an additional machine but it is less expensive than the tensile tester. In most instances after the transverse test, half of the bar is used to drill for the sample for chemical analysis, and also it may be used for the brinell hardness test.

Flowability Test—The fluidity test using the spiral is not in general use, but certain shops apply this test. The degree of fluidity is measured by the length of the spiral cast which is marked off in 2-in. intervals.

Photomicrographs—Most of the large shops with adequate metallurgical facilities employ the microscope to excellent advantage to determine the actual structure of the metal. These studies in most instances will clearly reveal the reasons for success or failure in the performance of the iron. Additionally they will explain where the chemical tests are still obscure.

Graphitizers and Deoxidants—The term "graphitizing" really means the dissociation of cementite with the formation of free carbon or graphite. For example, a metal cooled extremely rapidly may be white because the graphite has not had time to separate and remains in the metal as Fe_3C. This same metal if cooled slowly would probably have the gray structure characterising the effect of free graphite.

In most cases deoxidants are graphitizers. For example, ferrosilicon is

(*Concluded on page* 155)

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- WESTERN FOUNDRY SAND CO. Seattle, Washington
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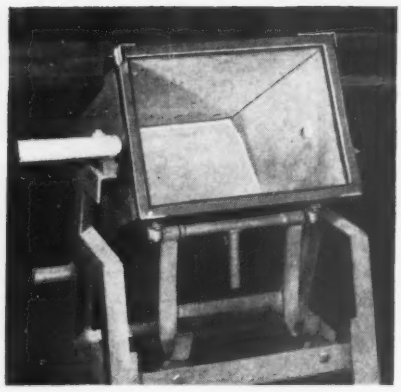
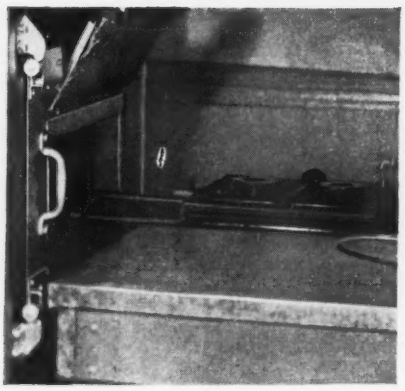
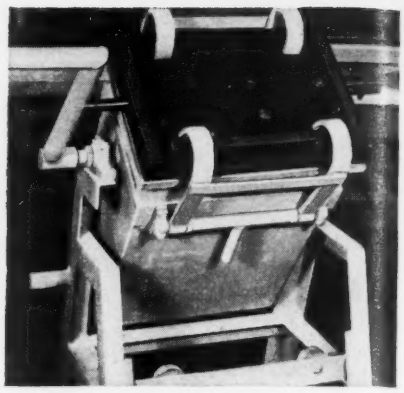


1 The "dump-box" — showing the sand-Resinox resin mixture.



2 A heated pattern plate comes from the oven.



3 The box with pattern plate attached is inverted for build-up of mold.

6 Steps from mold making to casting . . . that's SHELL MOLDING

This picture strip shows six steps in the preparation of test molds using equipment in the Monsanto Research Laboratories.

Monsanto offers to make several test molds from your pattern using this laboratory equipment. The molds will then be shipped to you for casting from your conventional casting equipment.

Now you can test Shell Molding in your own plant with a minimum of time and expense. See how **RESINOX** phenolic resins are used to produce thin, lightweight shells that yield castings with superior finish; machining is reduced, often completely eliminated; metal yields are higher, with less scrap from mechanical defects.

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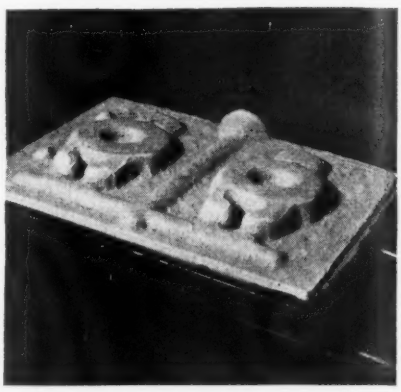


4 Green mold formed on pattern being charged to oven.

5 Cured shell mold is stripped from the pattern plate.

6 An assembled mold—with typical castings.

(*Concluded from page 152*)

used to soften the metal. It does this because it permits the formation of free graphite. It counteracts the hardening tendency when the iron has been oxidized. Carbon in the form of flake or powdered graphite is used for the same purpose. Both ferrosilicon and graphite are used as ladle additions or added to the stream as the metal is tapped from the cupola. They are also used in lump form and added to the cupola charge to serve the same purpose during melting. A silicon carbide product is also added to the cupola charge as a deoxidizer.

We see, therefore, that the terms "graphitizer" and "deoxidizer" are synonymous in certain cases. Other elements, such as nickel and chromium, are graphitizers but cannot be termed "deoxidizers."

Titanium operates in much the same manner as silicon, serving as both a deoxidizer and graphitizer. It is more powerful in this respect than silicon. Various proprietary alloys are used as deoxidizers—for example, SMZ, CSMZ, calcium silicon, calcium manganese silicon, Graphidox, etc. These are compounded and used as inoculants in the molten metal.

Use of Alloys—We will not attempt to cover the full range of alloys used in the production of gray iron. Their purpose, as everyone knows, is (1)—to correct any inequalities in the metal due to normal variations, (2)—to improve the casting for a specific purpose.

It is almost impossible to operate a cupola and produce a constant quality metal. This is due largely to the native variations in the materials and the equipment used. Additions of certain alloys to the metal as poured tend to average out the qualities in the metal and produce fairly uniform characteristics.

Silicon—This material can be used to alloy the metal to higher-than-normal content for specific purposes or it can be used in limited quantities to serve as a graphitizer or inoculant, or to make up a deficiency in the charge.

Manganese—It serves not only as a scavenger for the sulphur but also is used in certain instances in larger amounts to harden the metal.

Phosphorus—This is generally not considered as an alloy for cast iron. However, ferrophosphorus is available and used in certain instances to improve flowability.

Nickel—Nickel is used in alloying with gray iron over a wide range for improvement in strength, structure and machinability. It is a good graphitizer in the lower amounts.

Molybdenum—This is used to increase the strength. It also increases hardness and toughness. For this reason it is used to improve wear resistance and general toughening of the metal.

Copper—Copper is used for much the same purpose that nickel is, but its effect it not as positive. Additionally, copper will improve the resistance to corrosion, as also does nickel.

Vanadium—Vanadium is a deoxidizer but tends to prevent graphitization. It will improve the strength and wear resistance of the iron.

Zirconium—This is essentially a deoxidizer and is generally used as an inoculant with certain other alloys.

Borden Co., New York, has begun construction of a new $365,000 research laboratory at its Chemical Division in Philadelphia. It will be a one-story steel, concrete and glass building, with floor space of aproximately 11,000 sq ft. Upon completion of new laboratory, the Chemical Division will vacate its present location in the Stokes & Smith Co. building, Philadelphia.

Meetings of Interest to Foundrymen

Jan. 14-17—Plant Maintenance Conference and Show, Convention Hall, Philadelphia

Jan. 17-19—California Regional Foundry Conference, Northern and Southern California Chapter, AFS, San Francisco

Jan. 18 — Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland

Jan. 31-Feb. 1—American Society for Metals, mid-winter technical meeting, William Penn Hotel, Pittsburgh

Feb. 7-8—Wisconsin Regional Foundry Conference, Wisconsin Chapter, AFS, and University of Wisconsin, Hotel Schroeder, Milwaukee

Feb. 14-15—Foundry Educational Foundation, technical and university advisory committees conference, Hotel Statler, Cleveland

Feb. 21-22—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama student Chapter, AFS, Tutwiler Hotel, Birmingham

Feb. 22—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Feb. 25-26—Materials Handling Conference, Purdue University, West Lafayette, Ind.

Mar. 3-7—American Society for Testing Materials, spring meeting, Statler Hotel, Cleveland

Mar. 7—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

Mar. 18-19—Steel Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Mar. 28—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Mar. 31-Apr. 2—American Institute of Mining & Metallurgical Engineers, national open hearth conference, Hotel William Penn, Pittsburgh

Apr. 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

May 1-7—American Foundrymen's Society, International Foundry Congress and Show, Atlantic City, N. J.

May 6-9—International Lighting Exposition and Conference, Public Auditorium, Cleveland

May 16—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

May 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 16-17—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 23-27—American Society for Testing Materials, annual meeting, Statler Hotel, and Hotel New Yorker, New York

July 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Sept. 8-10—American Standards Association, national standardization conference, Museum of Science & Industry, Chicago.

Sept. 8-12—Instrument Society of America, annual meeting, Cleveland

Oct. 16-17—Gray Iron Founders' Society, annual meeting, Hotel Cleveland, Cleveland

Oct. 16-17—Malleable Founders' Society, market development conference, Case Institute of Technology, Cleveland.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-24—American Society for Metals, National Metal Congress and Exposition, Philadelphia

Nov. 19—American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York

ALBION

TO celebrate the completion of a large plant expansion program, Albion Malleable Iron Co., Albion, Mich., held open house Nov. 13 to 17. While citizens of the community were welcome any day from 12:30 to 3:30 p.m. and on Saturday from 9 to 11 a.m. and 1 to 3:30 p.m., the different groups were scheduled as follows: Tuesday, Nov. 13, Employees Family Day; Wednesday, Nov. 14, Albion Day; Thursday, Nov. 15, Customers Day; Friday, Nov. 16, Industry Day; Saturday, Nov. 17, morning, Public, afternoon, Manufacturers Representatives. During the five days, 5500 interested people visited the plant. On Employees Family Day, union and company officials were co-hosts.

MALLEABLE . . . *Holds Open House*

The entire visitation program was exceptionally well planned and gave all visitors an interesting picture of how malleable castings are made, the steps taken by Albion to assure high quality, and the many uses of malleable castings.

Departing from the usual method of sending visitors through the plant in small groups accompanied by a guide, those attending the open house were permitted to take just as long as they desired to make the plant inspection. The route of the inspection tour was well marked with ropes and yellow lines on the floor. Along the route tables held examples of the product produced in the adjacent department, and also showed the raw materials used in that operation. For example, at the core department, various binders, sands and samples of baked cores were shown.

Also along the lines, guides wearing white coats and red hats and ties, were stationed to answer any questions and explain the process. While the melting furnaces were not on the route, visitors were taken there upon request. The guides were most enthusiastic in describing the operation of the various departments and did much to make the visitors feel that this was a good company making a good product.

Visitors entered the front office door, registered and then were greeted by President Collins Carter, Vice President Thomas Lloyd, Secretary Gardner Lloyd, Treasurer Arthur Eastcott and other members of the office staff. They then proceeded to the engineering department, laboratory, and on to the foundry. Departments visited included the core, molding, shakeout, sorting, annealing, finishing, shipping, maintenance, first aid, etc. Near the end of the tour, visitors were provided with coffee, ginger ale, cookies and doughnuts.

Along the route, various types of displays illustrated uses of malleable iron. For example, a 1904 Oldsmobile and a 1951 Reo ½-ton 6 x 6 U. S. Army Eager Beaver illustrated automotive applications. Display boards

(*Concluded on page* 158)

(*Concluded from page* 157)
illustrated other uses.

Near the refreshment stand the movie, "This Moving World," of the Malleable Founders' Society, was shown continuously. Many of the scenes shown in that movie were taken at Albion.

As the visitors left the building through the very attractive employees' entrance, they were presented a well conceived and beautifully prepared booklet on the company and its operations, entitled "Men and Metal," and a souvenir cast in the plant.

Citizens of Albion and the surrounding territory entered into the spirit of the open house. The *Albion Evening Recorder* published a special Malleable edition. Students came from Michigan State, Albion College and the public schools of Battle Creek as well as from the Albion schools. Rotarians and other clubs made the plant visit a part of their activities. Few in the area missed seeing this modern plant in full operation.

Man-to-Man

(*Concluded from page* 124)
of a struggle Mother let me have a glass bowl (just a cheap one) and I made a mold of it using Albany sand and poured aluminum into it—darned thin section too, but doggone if I didn't get it.

But this isn't the point of my story—it was the finish on the casting. I'll swear it looked as though it had been buffed. I had always thought, at least I had heard some place, that too shiny a surface on a pattern was likely to make the sand stick to it. Since this experience I have fiddled around with super finishes on patterns to a point where I feel quite sure that there is much to be learned and plenty to be gained.

Maybe there is nothing startling in this little adventure of mine but I have had enough encouragement to make me feel that pattern finishes can well be re-examined, particularly since the shell molding process seems to be a topic of general interest. Just the other day a good friend of mine sent me several castings which reminded me of some rather rugged patterns, as far as finish is concerned, I saw while going through his plant.

Just another thought—saw a picture and description of a little gimmick for flaring out sprues. I made a wooden pattern of it, cast it in aluminum and finished it up slicker than an ice cube. It works swell; in fact, the smooth funnel it puts in the sprue had something to do with my tirade on smooth plumbing in molds.

Again I appreciate that you professionals can't go barging off on these wild goose chases like I can, but on the other hand, you can have a log book handy like the one I keep where you can jot down your brainstorms and thought starters, no matter how goofy they might seem at the time. If there is something to them they'll keep, and if there isn't all you'll be out is a crumb of time and a few grains of graphite.

Then there's always the chance that the list will get so long you'll have to start an engineering nook or department in the place—and there couldn't be anything finer happening to you. We've all got to pitch together to build up our engineering and research activities so they are in keeping with the importance of our industry and the opportunity lying ahead in it for all of us.

OBITUARY

J. ERNEST HIGSON, 80, president, U. S. Foundries Inc., and co-owner of Western Foundry, both of Denver, died Nov. 23. Mr. Higson was influential in development of the foundry industry in the Denver area for over 60 years. A native of Milwaukee, he went to Gunnison, Colo., at

J. ERNEST HIGSON

an early age, where his father became foundry superintendent of Gunnison Iron Works. Mr. Higson became a partner in Western Foundry in 1907, which he operated on a partnership basis in recent years with his son, J. L. Higson. He was elected president of U. S. Foundries Inc. in 1948, following several years' service as vice president.

* * *

Karl R. Rosenhahn, 73, inventor and former foundry owner, died Nov. 21, at his home in Newark, N. J. Mr. Rosenhahn, a native of Germany, came to the United States in 1904. Until his retirement 4 years ago he owned and operated the former Trio Aluminum Foundry Co., Hillside, N. J., which he started in 1920. He had invented and patented many small locks, pulleys and latches.

* * *

Ray A. Garrison, 56, vice president, director and works manager, Adirondack Foundries & Steel Inc., Watervliet, N. Y., died Nov. 10 at his home in Newtonville, N. Y. Mr. Garrison was a member and former chairman of the technical and operating division, Steel Founders Society of America, and a member and former director of the Eastern New York Chapter of the AFS.

* * *

Walter S. Lister, 80, former chairman of the board, C. O. Bartlett & Snow Co., Cleveland, died Dec. 4 at his home in Brecksville, O. Mr. Lister, a native of Iowa, became secretary-treasurer of Bartlett & Snow early in the century. He was named president in 1922 and served as chairman of the board from 1942 until 5 years ago.

* * *

Raymond C. Force, 71, former president, Caterpillar Tractor Co., Peoria, Ill., died Nov. 15 in Oakland, Calif. Mr. Force served as the company's first president from 1925 to 1930, then became chairman of the executive committee. He was a member of the board of directors until his death.

* * *

Charles R. Willis, 60, foundry superintendent, Eberhard Mfg. Co., Cleveland, died Nov. 14. Until about 10 years ago Mr. Willis was foundry superintendent, Eastern Malleable Iron Co., Naugatuck, Conn., of which Eberhard Mfg. Co. is a division.

* * *

John N. Mortimer, 85, until his retirement in 1940, secretary, Central Brass Mfg. Co., Cleveland, died Nov. 27. Mr. Mortimer was born in England and joined the company shortly after he went to Cleveland in 1895.

* * *

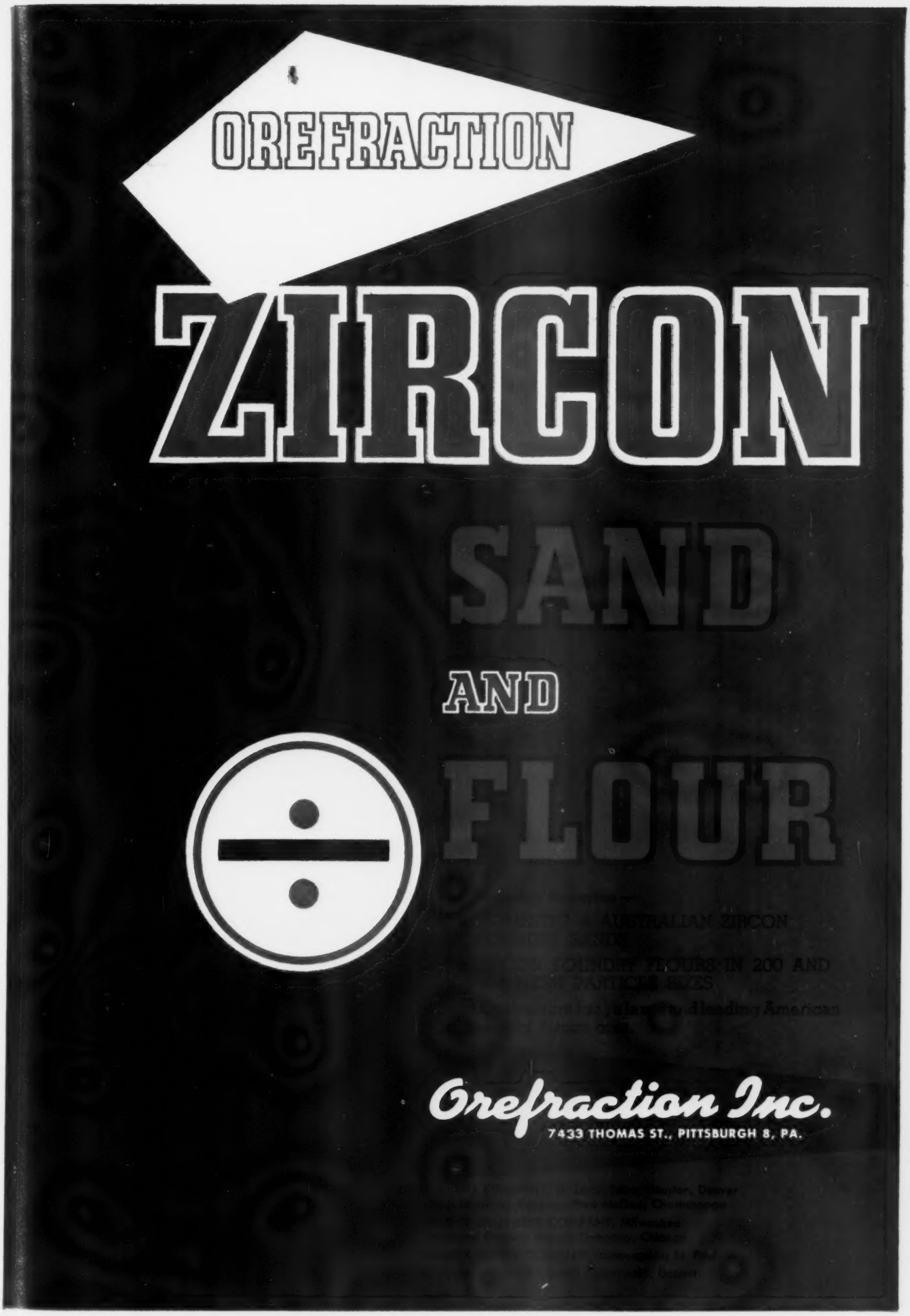
Jay V. Brost, 66, president, Brost Pattern & Casting Co., Cleveland, died Nov. 26, as the result of an automobile accident near Grand Rapids, O.

* * *

Thomas L. Adas, 45, for a number of years prior to 1949 manager, Chicago Mfg. & Distributing Co., Chicago, foundry supplies, died in that city Dec. 5.

* * *

George E. Doke, 74, president of the Association of Manufacturers of Chilled Iron Car Wheels until his retirement in 1932, died at his home in Yonkers, N. Y., Dec. 6.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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	713,330	371,214	.....
1950			
Sept.	82,479	46,927	152,583
9 mo.	653,861	362,274	.....
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,192	.....
1951			
Jan.	92,508	54,817	234,060
Feb.	88,950	54,915	255,347
Mar.	101,667	60,265	267,169
Apr.	97,276	57,554	276,463
May	100,800	61,373	274,954
June	94,376	57,176	258,144
July	76,826	45,072	263,017
Aug.	90,727	57,164	249,273
Sept.	82,276	48,568	244,575
9 mo.	825,406	496,904	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Mold	Perm. Die	Unfilled Orders[3]
1949	724,053	654,444	37,311	.....	
1950					
Sept.	95,641	87,111	4,630	58,673	
9 mo.	712,340	644,501	35,931	.....	
Oct.	105,746	96,911	5,064	66,560	
Nov.	103,694	93,607	5,776	67,931	
Dec.	100,548	90,513	5,985	69,569	
Total	1,016,180	918,883	52,756	.....	
1951					
Jan.	102,643	92,171	6,363	77,580	
Feb.	96,946	87,667	5,427	75,967	
Mar.	110,887	100,221	6,405	79,766	
Apr.	101,506	91,852	5,802	82,711	
May	105,438	95,049	5,986	84,002	
June	98,559	88,818	5,358	83,518	
July	76,551	69,334	4,064	85,837	
Aug.	94,443	84,720	5,097	84,821	
Sept.	85,433	76,304	5,161	84,611	
9 mo.	872,406	786,136	49,663	.....	

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Perm. Total	Shipments—Perm. For Sale	Shipments—Sand For Sale	Unfilled Orders[3]
1949	304,409	106,825	102,908	87,812	.....
1950					
Sept.	42,061	14,369	13,085	13,594	89,723
9 mo.	312,523	106,251	99,836	99,216	.....
Oct.	47,278	15,994	14,893	15,408	102,938
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,538	14,401	14,554	12,641	93,264
Feb.	40,785	14,106	13,082	12,852	94,581
Mar.	42,204	15,900	12,771	12,677	100,453
Apr.	40,242	14,455	12,901	12,079	106,077
May	40,487	14,798	13,400	11,692	112,638
June	35,961	13,853	10,323	10,850	112,760
July	27,426	10,739	7,142	8,693	119,461
Aug.	35,531	14,128	10,922	9,526	117,888
Sept.	32,487	13,086	8,829	9,730	122,973
9 mo.	337,661	125,466	103,924	100,740	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	9,364	8,781	....
1950			
Sept.	1,231	1,154	4,942
9 mo.	7,924	7,407	....
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616
Feb.	1,907	1,801	10,878
Mar.	2,156	2,058	12,196
Apr.	2,267	2,161	12,191
May	2,334	2,206	12,867
June	1,758	1,642	14,331
July	1,676	1,557	15,528
Aug.	2,270	2,135	16,095
Sept.	2,010	1,931	16,407
9 mo.	18,218	17,230	....

Foundry Production Workers

Estimated Number

	Sept. 1951	Aug. 1951	Sept. 1950
Gray Iron	155,600	156,300	150,300
Malleable	28,100	28,200	24,700
Steel	65,400	64,700	49,400
Nonferrous	88,100	90,800	85,400

Average Weekly Earnings

Gray Iron	$68.43	$68.31	$68.19
Malleable Iron	71.04	71.43	68.55
Steel	76.71	76.25	66.00
Nonferrous	75.91	73.29	70.45

Average Weekly Hours

Gray Iron	41.2	41.2	43.6
Malleable Iron	41.4	41.7	42.5
Steel	42.9	43.3	41.3
Nonferrous	42.6	41.5	42.8

Labor Turnover Rate (Aug.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	5.1	6.3	3.8	1.5
Malleable Iron	6.3	7.3	5.8	0.2
Steel	7.4	6.5	5.1	0.2
Nonferrous	4.2	6.9	3.6	2.2

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(Net tons[1])

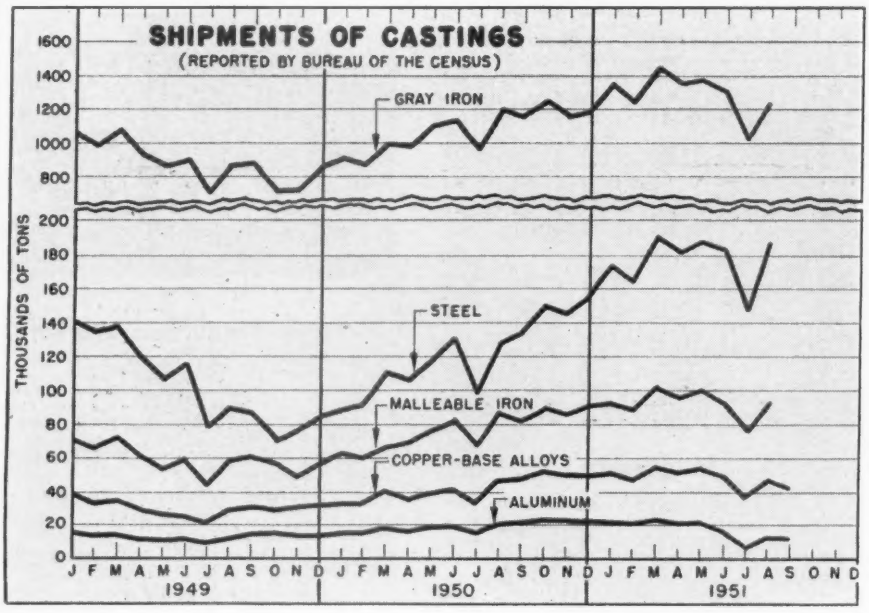
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Heavy Steel Ingot Molds Total	Heavy Steel Ingot Molds For Sale	Chilled Railroad Car Wheels Total	Chilled Railroad Car Wheels For Sale	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[2] Total
1949	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
9 mo.	9,307,917	4,870,166	5,845,648	2,374,568	1,682,878	761,380	379,698	335,327	858,226	541,765	.....
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	2,012,480
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Jan.	1,364,311	762,407	875,437	405,863	228,824	103,475	56,046	49,065	131,779	72,225	2,297,705
Feb.	1,234,226	684,928	811,724	369,932	193,648	91,598	49,423	43,967	117,141	62,290	2,391,843
Mar.	1,440,149	818,473	920,802	427,162	231,853	114,858	62,282	57,241	144,620	74,592	2,389,659
Apr.	1,363,041	766,735	880,381	403,619	217,970	106,417	61,993	54,002	134,302	68,395	2,336,926
May	1,396,236	796,053	897,913	418,950	225,129	112,145	65,721	57,485	139,854	67,619	2,228,596
June	1,308,987	742,794	847,024	395,329	216,620	108,042	58,620	52,700	121,851	64,872	2,162,152
July	1,028,812	568,126	653,656	301,749	200,764	97,575	40,792	35,202	88,217	45,383	2,208,116
Aug.	1,218,832	697,952	779,838	378,042	222,721	109,257	50,127	44,507	115,284	50,862	2,144,587
Sept.	1,114,789	625,511	704,657	328,331	204,856	96,011	45,467	41,360	111,893	47,916	2,055,392
9 mo.	11,469,383	6,459,998	7,371,432	3,428,977	1,952,385	939,378	490,471	435,529	1,104,941	564,154	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3] Total
1949	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
9 mo.	1,009,637	711,269	166,483	739,238	530,594	153,317	270,399	181,675	14,256	.....
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Jan.	174,056	124,002	42,805	135,086	98,197	37,790	38,970	25,805	5,015	675,385
Feb.	163,976	117,156	42,565	126,293	93,461	36,793	37,683	23,695	5,772	706,989
Mar.	190,665	134,184	44,196	148,884	107,745	39,492	41,781	26,439	4,744	779,717
Apr.	181,908	129,059	41,545	139,948	102,367	37,553	41,960	26,692	3,992	846,947
May	189,232	131,102	39,845	143,201	101,363	35,511	46,031	29,739	4,334	881,702
June	184,424	131,219	42,337	141,538	103,090	38,200	42,886	28,129	4,137	895,054
July	147,251	100,141	27,585	111,964	78,034	24,516	35,287	22,107	3,069	929,978
Aug.	177,096	128,981	41,763	130,913	99,732	36,086	46,183	29,249	5,677	944,211
Sept	160,695	116,658	35,500	120,632	89,771	33,086	40,063	26,887	2,414	918,038
9 mo.	1,569,203	1,112,502	368,141	1,198,459	873,760	319,027	370,844	238,742	39,154	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	1951
Jan.	159.3	668.0
Feb.	113.1	638.6
Mar.	225.2	599.0
Apr.	160.6	490.1
May	294.9	431.7
June	622.7	393.2
July	401.8	390.3
Aug.	693.6	404.5
Sept.	483.8	346.5
Oct.	526.8	372.4
Nov.	885.5	....
Dec.	526.2	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
Sept.	6,263,214	6,243,584	274,657
9 mo.	52,597,300	53,569,147	.....
Oct.	6,649,935	6,543,428	332,444
Nov.	6,243,970	6,131,733	317,120
Dec.	6,606,464	6,590,823	323,458
Total	72,097,669	72,735,131	3,337,517
1951			
Jan.	6,791,828	6,766,767	330,698
Feb.	6,001,538	6,036,774	293,169
Mar.	6,692,460	6,693,661	299,190
Apr.	6,484,258	6,354,400	356,816
May	6,747,163	6,732,825	368,511
June	6,574,621	6,645,155	330,920
July	6,636,335	6,502,058	301,125
Aug.	6,777,820	6,679,152	303,664
Sept.	6,468,080	6,364,628	272,402
Oct.	6,734,174	6,720,973	291,510
10 mo.	65,908,277	65,496,394	3,148,005

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Feb.	18,487	27,168
Mar.	22,494	31,997
Apr.	22,118	30,472
May	23,643	33,267
June	25,093	33,817
July	21,609	32,016
Aug.	29,689	25,285
Sept.	28,811	22,285
Oct.	32,240	23,124
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
9 mo.	388,697	244,541	.....
Total	536,398	341,833	.....
1951			
May	44,187	29,092	100,299
June	41,341	28,278	95,174
July	34,064	23,088	85,028
Aug.	37,321	22,985	80,588
Sept.	31,507	20,021	81,539
9 mo.	356,281	232,941	.....

Iron and Steel Scrap Consumption

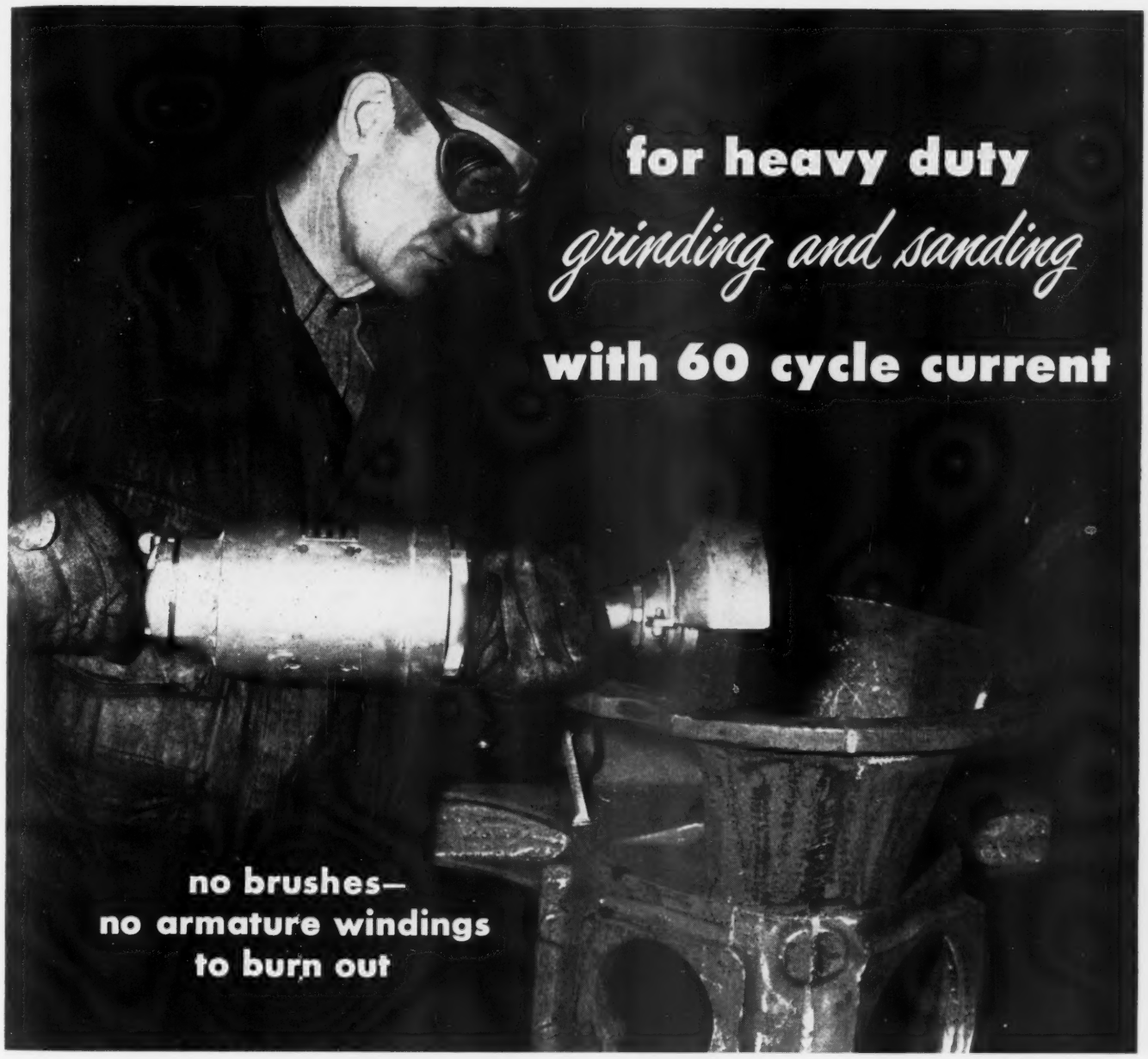
(Gross tons*)

	All Scrap Total	All Scrap Purchased	By Types of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1949	49,281,000	22,922,000	7,968,000	4,175,000	801,000	276,000	4,239,000	2,608,000
1950								
July	4,708,000	2,244,000	669,000	318,000	79,000	28,000	490,000	295,000
7 mo.	34,828,000	16,576,000	5,283,000	2,650,000	564,000	205,000	3,392,000	2,044,000
Aug.	5,202,000	2,454,000	862,000	426,000	108,000	39,000	568,000	327,000
Sept.	5,170,000	2,468,000	819,000	404,000	109,000	40,000	579,000	348,000
Oct.	5,643,000	2,707,000	866,000	437,000	108,000	40,000	643,000	384,000
Nov.	5,293,000	2,598,000	841,000	431,000	107,000	39,000	593,000	364,000
Dec.	5,361,000	2,600,000	803,000	418,000	122,000	44,000	600,000	361,000
12 mo.	61,497,000	29,403,000	9,474,000	4,666,000	1,118,000	407,000	6,385,000	3,828,000
1951								
Jan.	5,975,382	3,010,300	1,009,142	533,705	110,004	41,116	684,484	435,633
Feb.	5,337,562	2,691,692	936,918	492,395	101,233	38,135	627,308	398,814
Mar.	6,187,520	3,100,622	1,064,325	558,833	108,513	39,260	728,786	463,371
Apr.	5,987,947	3,013,527	1,029,069	545,897	103,458	37,973	704,416	457,521
May	6,096,678	3,087,313	1,063,281	568,198	111,914	39,312	734,483	484,878
June	5,693,402	2,847,856	972,949	517,604	108,740	39,454	693,636	462,092
July	5,298,644	2,581,856	747,864	393,254	80,903	29,858	632,782	421,689
7 mo.	40,577,135	20,333,166	6,823,548	3,609,886	724,765	265,108	4,805,895	3,125,998

Pig Iron Production and Consumption

	Production** Total	Production** Foundry	Production** Malleable	Production** Basic	Production** Low Phos. Intermediate Low Phos. & Bessemer	Consumption* Total	Consumption* Cupola	Consumption* Air	Consumption* Electric
	(Standard grades—1000 net tons)					(By type of furnace, 1000 gross tons)			
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
10 mo.	53,663.4	2,403.6	2,408.8	41,982.4	6,857.7	48,531	4,567	245	197
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	5,367	542	32	11
Feb.	5,084.8	238.7	226.0	4,007.2	612.9	4,725	492	29	10
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	5,406	550	33	15
Apr.	5,812.2	259.1	261.0	4,575.8	716.1	5,281	516	31	11
May	6,104.9	282.0	259.4	4,777.0	786.5	5,522	533	31	11
June	5,911.3	254.2	276.5	4,631.9	748.7	5,348	486	30	11
July	5,994.8	280.4	250.0	4,702.8	761.6	5,317	378	23	10
Aug.	5,988.6	252.7	254.4	4,723.3	758.2	5,385	...	..	..
Sept.	5,811.6	257.7	243.7	4,576.8	733.4	....	...	..	..
Oct.	6,112.6	260.6	299.4	4,777.4	775.2	....	...	...	...
10 mo.	58,541.8	2,653.3	2,580.2	46,049.0	7,358.7	....	...	...	...

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.



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Activities of Foundry

GROUPS

Southern California

CONSIDERATION of the analysis of foundry costs was featured at a meeting of the Southern California Chapter of the AFS, held at the Rodger Young Auditorium, Los Angeles, with an attendance of 144. Ralph L. Lee, secretary-treasurer, Grede Foundries Inc., Milwaukee, was the speaker.

He emphasized that accurate costs must be kept of every phase of operation to arrive at the exact cost of the job; therefore, costing amounts to almost a daily check of operations. Mr. Lee stated that the results of these checks will establish a cost standard applicable to approximately 90 per cent of the work done in foundries.

Items contributing to the cost standard are: Size, weight and complexity of the proposed casting; flask sizes needed, molding costs, including molding burdens; core costs including core burdens; cost of sand and additives; metal costs; cleaning costs; burden on each casting. In most cases castings should be sold by the piece and not by the pound because of latent inaccuracies in the latter method, unless a jobbing shop is concerned with running 5000 to 10,000 castings. It was further suggested that a great aid to all foundrymen would be the organization of cost groups among foundries to compare and discuss cost problems.—*Alfred A. Grant III, Grant & Co.*

Central Ohio

ANNUAL meeting of Central Ohio Chapter of the AFS was held Nov. 12 at Shawnee Hotel. Thomas Cusack, Oliver Corp., was in charge of arrangements and was chairman of the meeting.

I. R. Wagner, Electric Steel Castings Co., Indianapolis, and vice president of the American Foundrymen's Society, presented the coffee talk in which he outlined the progress of the society and urged participation by all members.

Principal speaker was C. C. Drake, director of plant protection and safety, Oliver Corp., South Bend, Ind. Mr. Drake's approach to the safety program is different in that he emphasized the psychological angle as most important. All are aware of the personal consequences of accidents including pain, physical injury and even loss of life. There are corresponding costs which industry recognizes. The less obvious hidden losses are: Breakage of equipment, time lost going for help; time lost by other men looking on; loss of materials in production. Mr. Drake pointed to the mental distraction of employees such as fear of war, taxes, strikes, family troubles and general unrest which often lead to accidents. The best supervisor is one who recognizes mental attitudes which may cause accidents and eliminates them if possible.—*Wilfred H. White, Jackson Iron & Steel Co.*

Ontario

CASTING design, subject for discussion at the Oct. 26 meeting of Ontario Chapter of the AFS, attracted an attendance of 250 members and guests. Meeting at the Royal York Hotel, Toronto, the topic was considered by a panel of experts under the chairmanship of H. H. Fairfield, William Kennedy & Sons Ltd., Owen Sound, Ont.

Those on the panel were: John Perkins, Ford Motor Co. of Canada Ltd., Windsor, Ont.; A. Reyburn, Cockshutt Plow Co. Ltd., Brantford, Ont.; R. T. Robertson, International Harvester Co. of Canada Ltd., Hamilton, Ont.; Alexander Pirrie, Standard Sanitary & Dominion Radiator Ltd., Toronto; George Cleary, Massey-Harris Co. Ltd., Brantford, Ont.; George Winkworth, Toronto Foundry Ltd., Toronto; and John Hughes, John T. Hepburn Ltd., Toronto.

Each panel member spoke briefly with slide illustrations on his personal experiences with the problem of casting design and the methods used in overcoming them. The general conclusion reached was that co-operation between the design engineer and the foundry could eliminate the majority of difficulties caused by casting design. J. J. McFadyen, Galt

(*Continued on page* 166)

SOUTHERN CALIFORNIA Chapter of the AFS met Nov. 9 at Rodger Young Auditorium, Los Angeles. At left, left to right, are Harold G. Pagenkopp, Angeles Pattern Works, chapter vice president, and Ralph L. Lee, Grede Foundries Inc., Milwaukee, principal speaker at the meeting. His topic was "Do You Know Your Costs?" A right is a table group. Photos by Ken Sheckler, Calmo Engineering Co.

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(*Continued from page* 164)

Malleable Iron Co. Ltd., Galt, Ont., spoke on the problem from the jobbing foundry standpoint.

The chapter's Education committee has arranged three foundry courses which are being given in Brantford, Hamilton and Toronto. Those in Brantford are held once a week at the city's Collegiate Institute and Vocational School and cover metal melting, sand control, molding, coremaking, gating and risering and casting defects. The Hamilton course, held in the Central Secondary School, is a practical course in molding. There are 20 lessons in the Toronto course, which is being given at the Western Technical School and covers general foundry practice. — *Charles Thompson, Galt Malleable Iron Co. Ltd.*

Northeastern Ohio

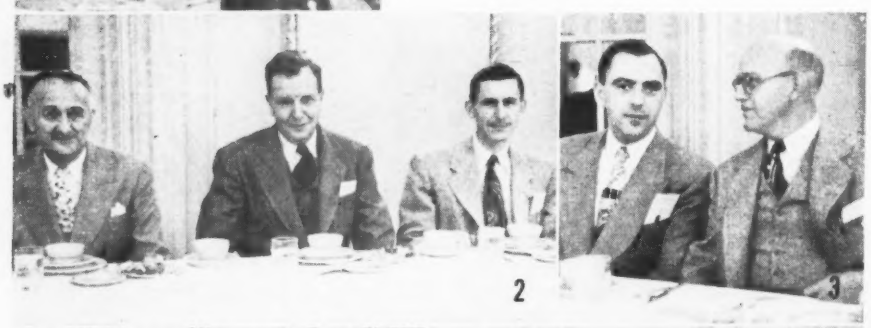
A GOOD turnout was evident at the Nov. 8 meeting of Northeastern Ohio Chapter of the AFS, held at the Cleveland Club. Coffee talk was presented by Charles Esgar, Foundry Educational Foundation, Cleveland, who described that organization's objectives, how it functions, and advantages offered to both industry and college students.

Main session was devoted to a discussion of "Control of Core Production," with Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, the speaker. He pointed out that consistent results are obtained only when a uniform grain size sand is used since fine sands require more binder than coarse sands. Core oil alone will provide sufficient baked strength, but lacks green strength so cereal or clay is added to keep sagging at the minimum.

In general about 1 per cent core oil is sufficient, and the amount of cereal may vary from ½ to 2 per cent. Amount of water should just be sufficient to provide workability. Excess requires longer baking time. For high green strength it is preferable to use 2 parts water to 1 part cereal, and for high baked strength 4 parts water to 1 cereal. Sand should be dry, and all materials weighed. Best core properties are attained when moisture, cereal and oil are added in that order. Mr. Bishop's talk was concluded with showing of the sound-color film "The ADM of Cores" which depicted the practical and laboratory phases of coremaking and control.

The patternmaking division of the chapter in a separate meeting discussed proposed changes in the AFS color standards for patterns. Vincent J. Sedlon, Master Patterns Co., presided, assisted by a panel comprising John Roth, Cleveland Standard Pattern Works; Walter Hehr, Mohawk Pattern Works; Walter Siebert, Elyria Foundry Division, and Joseph Kreiner, National Malleable & Steel Castings Co. The group generally favored the proposed changes, which include a clear coating instead of black for the body of the pattern.— *Edwin Bremer and William G. Gude.*

NORTHEASTERN OHIO Chapter of the AFS heard Bernard N. Ames, New York Naval Shipyard, Brooklyn, N. Y., discuss "Plastic Bonded Shell Molds" at its Oct. 11 meeting, Tudor Arms Hotel, Cleveland. Shown in Fig. 1, left to right, are: Mr. Ames, and Gilbert J. Nock, Nock Fire Brick Co., chapter president. Fig. 2—Frank C. Cech, Cleveland Trade School, chapter vice president; Elmer Zirzow, Werner G. Smith Inc., and Robert H. Herrmann, *Foundry*. Fig. 3—James J. Martin, Royal Pattern Co., and John Saunders, Carborundum Co., Niagara Falls, N. Y., speaker before the patternmaking division. Fig. 4—Al Fath, PMS Co., and Dave Clark, Forest City Foundries Co. Fig. 5—Jack Kroecker, Aluminum Co. of America, and Walter Quayle, National Malleable & Steel Castings Co. Fig. 6—Bruce Aiken, Crucible Steel Casting Co., and Charles N. Philips, a visitor from Bakersfield, Calif. Fig. 7—John Davenport, Fulton Foundry & Machine Co., and Thomas W. Gallagher, Lake City Malleable Co. Photos by Sterling N. Farmer, Sand Products Corp.



New England

MANAGEMENT'S responsibility in the control of 'foundry defects' was discussed by Ralph Clark, Electro Metallurgical Co., division of Union Carbide & Carbon Co., New York, at the Nov. 14 meeting of the New England Foundrymen's Association held at the Boston Engineers Club. Approximately 125 members and guests, including several members of the Massachusetts Institute of Technology Student Chapter of the AFS, were present.

The speaker reviewed many of the common foundry defects and made recommendations for their control. He emphasized the important func-

(*Continued on page* 168)

This Lectromelt furnace with rapid top charging is saving man-hours for Dominion Foundries & Steel, Ltd., Hamilton, Ontario, Canada, for over 30 years producers of Dofasco Double Refined Steel Castings.

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MOORE RAPID

WHEN YOU MELT... *Lectromelt*

(*Continued from page* 166)

tion of management in the control of defects, stating that the molder, coremaker, melter and laboratory technicians produced work according to the quality of the equipment given them. It is management's job to be alert to improvements in methods and to provide their men the best tools conditions will allow.—*Myron DeHollander, General Electric Co.*

Western New York

NODULAR iron was the topic of discussion at the Nov. 9 meeting of Western New York Chapter of the AFS, held at the Sheraton Hotel, Buffalo. Thomas E. Eagan, research metallurgist, Cooper-Bessemer Corp., Grove City, Pa., addressed a record attendance.

Mr. Eagan first discussed the history of nodular iron and then illustrated with slides its as-cast and annealed microstructures. Essential prerequisite to nodularization is low sulphur content, preferably 0.03 per cent or less. Manganese content should be 0.30 per cent maximum and phosphorus 0.10 per cent to increase the ductility of the iron as-cast and annealed. He also emphasized importance of temperature control before the magnesium-nickel or other nodularizing agents are added. Too high temperature causes greater losses of magnesium and the iron cannot be converted to the nodular form. Because this type of iron shrinks more than cast iron, practice similar to steel founding must be followed in building patterns, gating and risering.

WESTERN NEW YORK Chapter of the AFS met Nov. 2 to hear Thomas E. Eagan (left), Cooper-Bessemer Corp., Grove City, Pa., discuss "Practical Aspects of Nodular Iron." Meeting chairman, Joseph M. Clifford, Bison Castings Inc., Buffalo, is at right. Photo by Marve Taublieb, Frederic B. Stevens Inc.

As-cast nodular iron has good wear resistance and may be flame hardened. Annealing treatment consists of heating to 1700° F for two hours, cooling in the furnace to 1260° F and maintaining this temperature for ten hours, then cooling to 1000° F in the furnace. The castings then may be air cooled. Tensile strength as-cast is 90,000 to 100,000 psi with 1 to 1.5 per cent elongation. After heat treatment the tensile strength is 70,000 to 75,000 psi with 10 to 14 per cent elongation in 2 in. Its machinability is good. Pressure castings stand up well and resistance to grain growth and scaling up to 1650° F is remarkable.—*T. H. Burke, Worthington Pump & Machinery Corp.*

Eastern Canada

A TWO-DAY conference, sponsored by the Eastern Canada Chapter of the AFS was held at Three Rivers, Que., Nov. 2-3. The program was under the chairmanship of W. C. Perrot, Canada Iron Foundries Ltd.

A large number of the foundrymen visited the Three Rivers Technical School, which teaches arts and crafts of all kinds including foundry, patternmaking and machine shop practice. They were also interested in the production of centrifugally cast iron pipe by the DeLavaud process at Canada Iron Foundries Ltd., as well as its brake shoe foundry, conveyorized mold and casting handling equipment and continucus melting and pouring practices. The group assembled in the evening at the Chateau de Blois Hotel for a concert by the Canada Iron Foundries Glee Club.

Following dinner, a technical session took the form of a "Casting Morgue" and featured the inquest on a number of defective castings supplied by several foundries. An interesting discussion of causes and corrective measures was held under the direction of Henry Louette, Warden King Ltd., Montreal.

On Saturday the foundrymen were taken on a tour of the Canadian International Paper Co. Ltd., one of the world's largest newsprint mills. They were most interested to see many tons of castings at work, including many identified by some visitors as products of their own foundries. The meeting concluded with a luncheon at which Canada Iron Foundries Ltd. was host.

(*Continued on page* 170)

EASTERN CANADA Chapter of the AFS held a conference Nov. 2-3 at Three Rivers, Que. Left to right: J. A. Mongrain, mayor of Three Rivers; J. J. MacFadyen, Galt Malleable Iron Co., Galt, Ont., national AFS director, and W. C. Perrot, Canada Iron Foundries Ltd., Three Rivers, conference chairman, examine defective castings discussed at the "casting morgue" technical session

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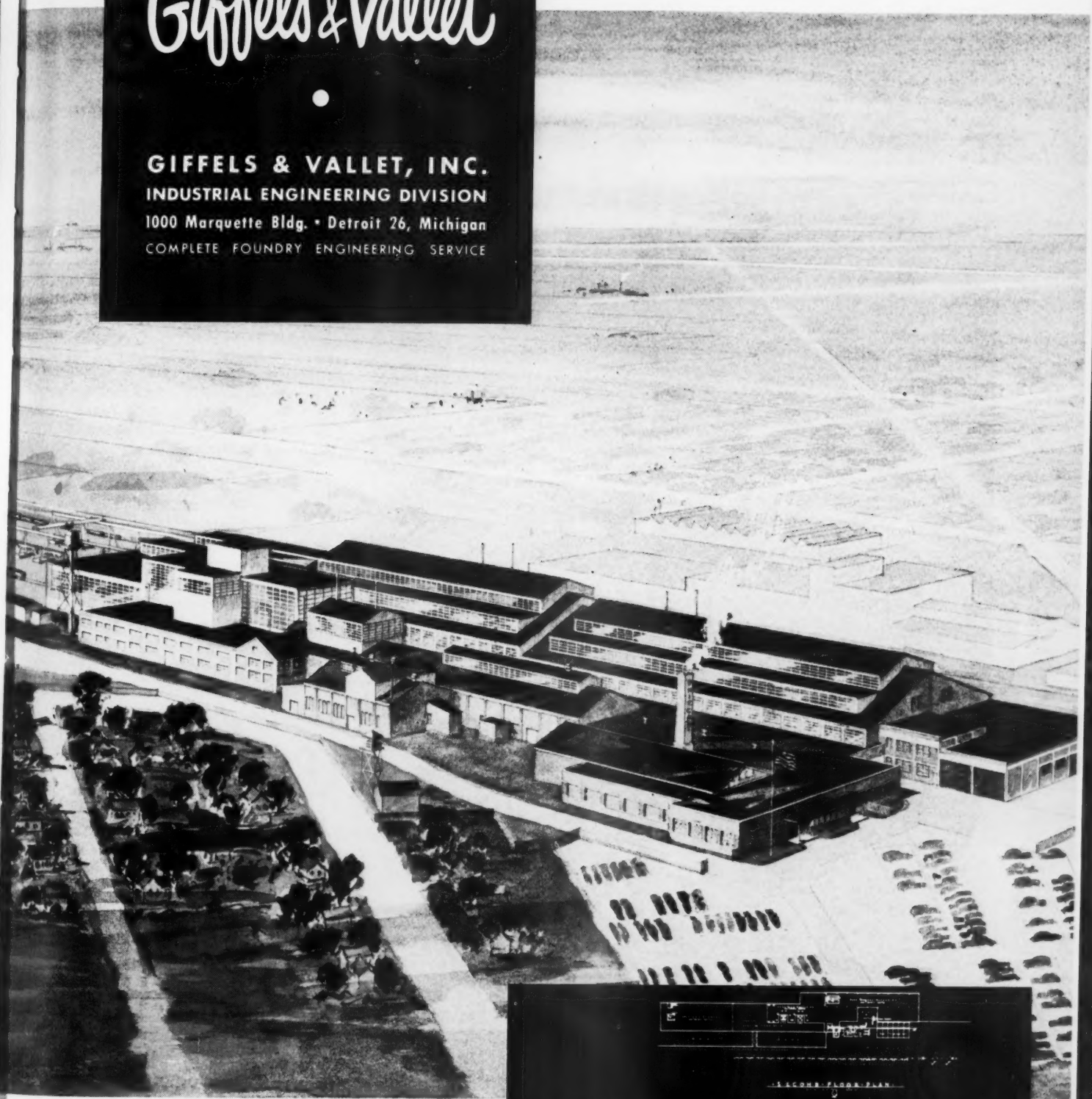
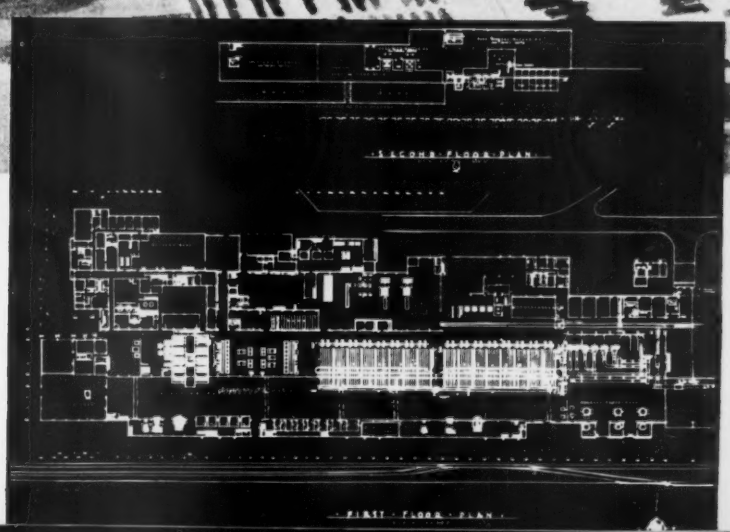




UNITCAST CORPORATION,
Toledo, Ohio

(*Continued from page* 168)

The conference, voted a great success, had members and friends present from as far as Sydney, Nova Scotia, Ontario and the United States.—*M. McQuiggan C. O. Clark & Bros.*

Wisconsin

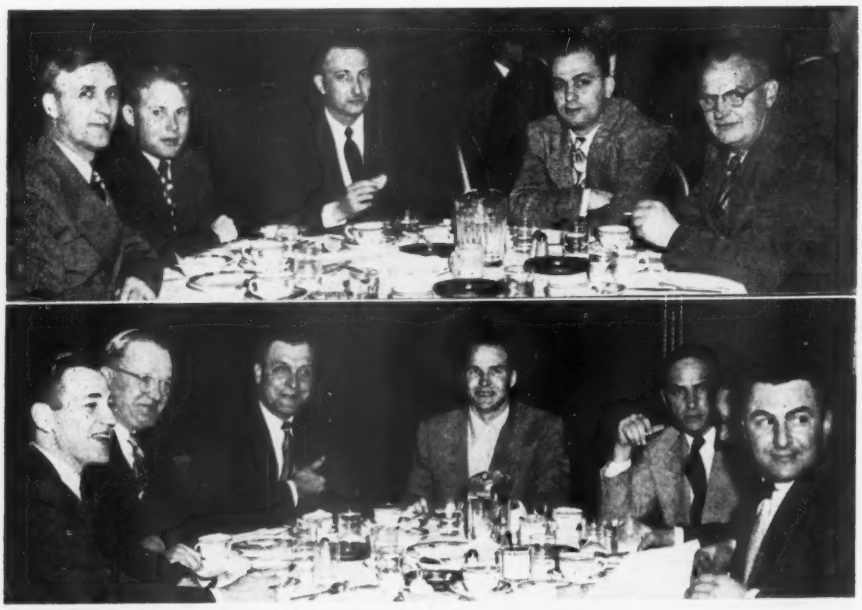
SPECIAL speakers for the various divisions of the foundry industry were featured at the Nov. 9 meeting of Wisconsin Chapter of the AFS. At a joint meeting of the malleable, steel and pattern groups, with Martin Harder, Lakeside Malleable Castings Co., Racine, Wis., as chairman, George E. Miller, Osborn Mfg. Co., Cleveland spoke on "Modern Trends in Molding Machines." Palmer Hansen, Osborn Mfg. Co., served as discussion leader following the talk.

The gray iron group was addressed by Norman A. Birch, metallurgist, American Brake Shoe Co., Meadville, Pa., whose subject was "Gating and Risering Control." Art Janes Jr., Standard Foundry Co., Racine, Wis., acted as chairman.

Ray A. Witschey, ceramic engineer for A. P. Green Fire Brick Co., Mexico, Mo., addressed the nonferrous group on "Refractory Practice." C. Kotowicz, Ampco Metal Co., Milwaukee was chairman for this group.

After dinner, William Maas, prominent Milwaukee civic dealer, presented the coffee talk which he entitled, "Our America." There were 180 members and guests present at the meeting.—*John E. Hubel*

METROPOLITAN Chapter of the AFS heard J. E. Rehder, foundry engineer, Canadian Bureau of Mines, Ottawa, Ont., speak at its Nov. 5 meeting. Richard A. Flinn, assistant chief metallurgist, American Brake Shoe Co., Mahwah, N. J., right background, was technical chairman. Photo by W. G. Ettinger, American Brake Shoe Co.



WISCONSIN Chapter of the AFS held sectional sessions at its November meeting. Top two views show table groups at the meeting. At bottom left, left to right, are: N. A. Birch, metallurgist, American Brake Shoe Co., Meadville, Pa., speaker before the gray iron group, and Art Janes Jr., Standard Foundry Co., Racine, Wis., chairman of the gray iron group. Right, left to right: C. Kotowicz, Ampco Metal Co., chairman of the nonferrous group, and Ray A. Witschey, ceramic engineer, A. P. Green Fire Brick Co., Chicago, speaker at the nonferrous meeting. Photos by Walter Napp, Delta Oil Products Co.

Metropolitan

THERE were 110 members and guests present at the Nov. 5 meeting of Metropolitan Chapter of the AFS held at the Essex House, Newark, N. J. Speaker was J. E. Rehder, foundry engineer, Canadian Bureau of Mines, Ottawa, Ont. Dr. Richard A. Flinn, American Brake Shoe Co., Mahwah, N. J. was technical chairman.

Speaking on "Graphitization in Cast Iron," Mr. Rehder stated that a great deal of data worked out for the malleable irons has been ignored by gray iron foundrymen although the same principles apply to all cast irons, including gray, white, malleable and nodular. He advocated the use of higher temperatures in order to save time for the first stage of graphitization. A temperature of 1700° F will take one-third less time than is required at 1600° F. Annealing time is dependent on section size and usually must be determined by

(*Continued on page* 173)

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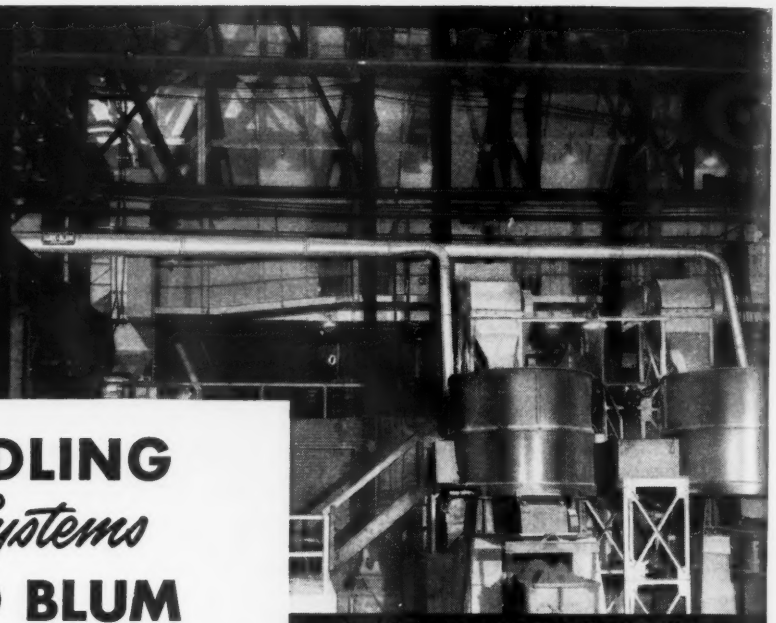

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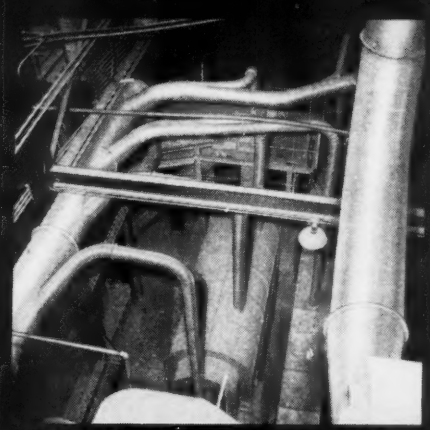
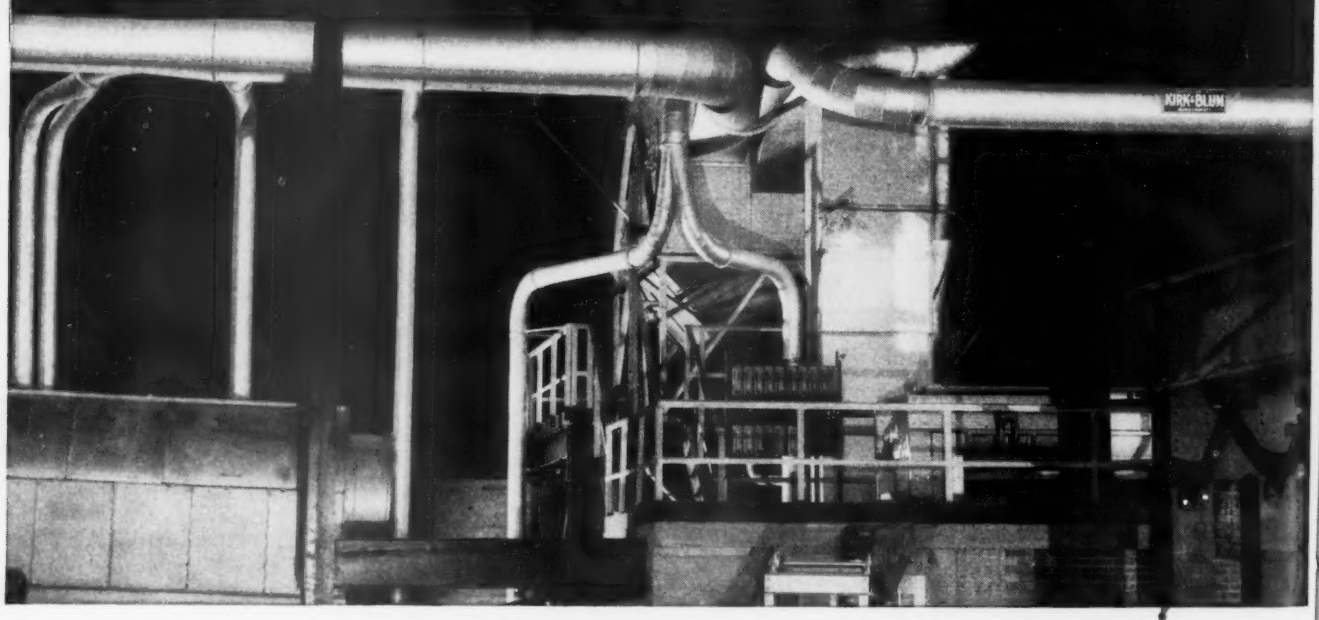


Kirk & Blum Dust Control on a Rotary Breaker Screen.

View of sand handling equipment with rotary breaker screen on the left.



(*Continued from page* 170)

trial. Decomposition of pearlite can be accomplished in less time by slow cooling from 1700° F than by holding below the critical temperature.

The speaker also discussed the effect of various elements on graphitization and presented some preliminary data from his current investigations.—*William T. Bourke, American Brake Shoe Co.*

Tennessee

PRINCIPAL speaker at the Oct. 26 meeting of Tennessee Chapter of the AFS was Sam F. Carter, assistant melting superintendent, American Cast Iron Pipe Co., Birmingham. He addressed 60 members and guests on the subject, "Basic-Lined Cupola." Using slides to illustrate his talk, Mr. Carter pointed out that the basic cupola is a comparatively new operation. It permits more flexibility and offers better control over sulphur, phosphorus and carbon as well as relief from poor raw material quality. —*Charles R. Appel, U. S. Pipe & Foundry Co.*

Rochester

SPEAKER at the Nov. 13 meeting of Rochester Chapter of the AFS was Clyde A. Sanders, vice president, American Colloid Co., Chicago. His topic was "Molding Sands."

Mr. Sander's varied experience in the industry convinced him of the necessity of watching sands and sand conditions in addition to watching metallurgy to develop good castings. Experiments with natural bonded and synthetic sands indicated that shrinks developed with either sands if the moisture content of the molding material was not in the correct proportion. With motion pictures and slides, Mr. Sanders showed the effects obtained on gray iron castings by proper application of bonding material and

TENNESSEE Chapter of the AFS heard Sam F. Carter, American Cast Iron Pipe Co., Birmingham, discuss the "Basic-Lined Cupola" at its Oct. 26 meeting

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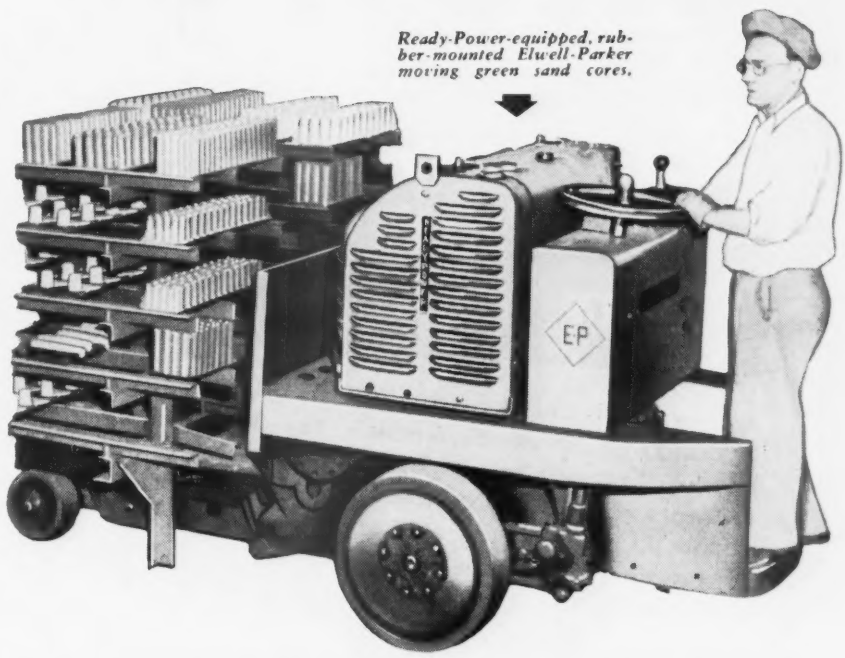

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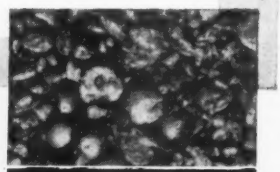
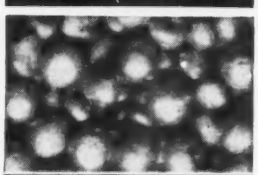
Abrasive used in 96 Wheel Hours	3500 lbs.	310 lbs.

savings (96 Wheel Hours) **3190 lbs.**

How would you like to cut your abrasive consumption 91%? It sounds fantastic, but that's exactly what happened at the Carbon Malleable Castings Company when they switched to Tru-Steel Shot. For, 310 lbs. of Tru-Steel cleaned a quantity of work requiring 3500 lbs. of chilled iron. Wearable parts, such as blades, impellers, control cages, end liners and deflectors, all had 3 to 5 times longer life.



CHILLED IRON No. 230 at Mag 10X (after 50 passes)



TRU-STEEL No. 230 at Mag 10X (after 1500 passes)

HERE'S WHY TRU-STEEL lasts longer

Tru-Steel Shot is perfectly formed of electric induction furnace steel that has received a full heat treatment . . . not just a draw or anneal. It is round and solid, hard and tough, and accurately controlled as to quality and hardness.

With Tru-Steel, wearable parts last longer and less machine maintenance is required. There is less abrasive to ship and store, and cleaning costs per ton are much lower.

Pound for Pound Tru-Steel Shot will clean more work than any other abrasive you can use. A test will prove this for you.

Mfg. by Steel Shot Producers, Inc., Butler, Pa.

TRU-STEEL SHOT — American

OFFICES IN PRINCIPAL CITIES

AMERICAN WHEELABRATOR & EQUIPMENT CORP. 505 S. Byrkit St., Mishawaka 2, Ind.

seacoal balanced with a correct proportion of water. The seacoal facings reduce the pipe in castings. Pouring temperatures were not as important in obtaining solid castings as sand conditions. By the use of test molds, it was proved that correct moisture plus seacoal and proper bonding material will do more to produce satisfactory castings than the exclusive consideration of metallurgy.—*Herbert G. Stellwagen, Hetzler Foundries Inc.*

Philadelphia

TWO educational courses beginning in January have been announced by Philadelphia Chapter of the AFS.

Beginning Monday, Jan. 14, a series of brass and bronze round table discussions will be held monthly at the Engineers' Club, Philadelphia. Each session will have a different moderator. Co-operating in this undertaking is the Philadelphia Chapter of the Non-Ferrous Founders' Society. All nonferrous foundrymen are welcome to attend whether or not they are members of the chapter.

In conjunction with the Philadelphia Society of Non-Destructive Testing, the chapter is arranging a study course covering all phases of nondestructive testing. The series is to start in January and further information may be obtained from R. N. Shaw, Society of Non-Destructive Testing.—*H. E. Mandel, Pennsylvania Foundry Supply & Sand Co.*

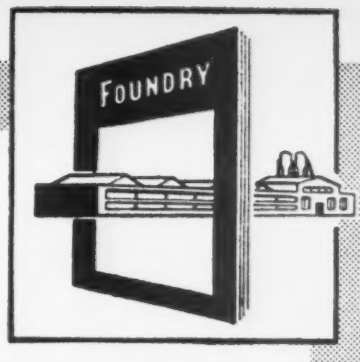
Twin City

SPECIAL guests at the Nov. 13 meeting of Twin City Chapter of the AFS were National Vice President I. R. Wagner, Electric Steel Castings Co., Indianapolis, and William W. Maloney, secretary-treasurer of the society. Meeting was held at the Covered Wagon, Minneapolis, with 100 members and guests present.

Mr. Wagner spoke briefly of the activities of the society and announced that the new headquarters building will be in Chicago, the final location to be announced shortly. Mr. Maloney spoke of the forthcoming International Foundry Congress and Show to be held in Atlantic City next spring.

Principal speaker was Fred B. Skeates, Link-Belt Co., whose subject was "Safety through Mechanization and Conservation of Manpower through the Conservation of the Manhour." In addition to increasing the total tonnage per employee, the industry has climbed the scale of safety records of the basic industries from sixth from the bottom to fif-

(*Continued on page* 178)



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Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

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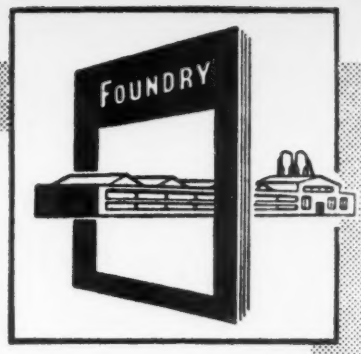

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YOUR NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

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Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

FOUNDRY
Readers Service

30 to 45 minutes faster Bake...
AT NO FANCY COST!!

You don't have to pay a fancy premium for an extra fast baking core oil!

The new WERSMITH core oils reach peak baked strength 30 to 40 minutes ahead of conventional core oils... frequently cost less than you may now be paying. Formulated especially to deliver maximum baked strength at lean ratios... fast-baking WERSMITH core oils shorten oven time-cycles . . . boost output . . . make certain cores are thoroughly baked.

For long-run economy... each drum delivers the same consistent quality and uniform performance that traditionally has always been built into Werner G. Smith core oils.

Check these savings for yourself! Order a trial drum "On Approval" today!

WERNER G. SMITH, INC.

1730 TRAIN AVE • TOwer 1-3676 • CLEVELAND 13, OHIO

(*Continued from page* 176)

teenth from the bottom. Important points to consider for safety in the foundry Mr. Skeates outlined as: Good housekeeping; preventive maintenance of machinery; proper goggle use; proper respirator use. He supplemented his talk with slides and a short film.

Concluding the program, the film, "The ADM of Cores," produced by Archer-Daniels-Midland Co., Foundry Products Division, was shown. This technicolor, sound movie ties control tests in the laboratory to the actual coreroom operation wherein production operations must be held constant to insure smooth performance.—*J. D. Johnson, Archer-Daniels-Midland Co.*

Tri-State

FIFTY-EIGHT members and guests of Tri-State Chapter of the AFS enjoyed the enlightening color film, "The ADM of Cores," produced by the Archer-Daniels-Midland Co., at its Nov. 16 meeting.

Emphasized in this film are: The development of a consistent coreroom practice from receipt of specified core materials to the final delivery of cores to the molder; and the application of laboratory tests on core materials to actual production. A discussion period following the film was led by A. C. Shaver, western divisional manager of the Archer-Daniels-Midland Co.—*J. G. Winget, Reda Pump Co.*

Pittsburgh

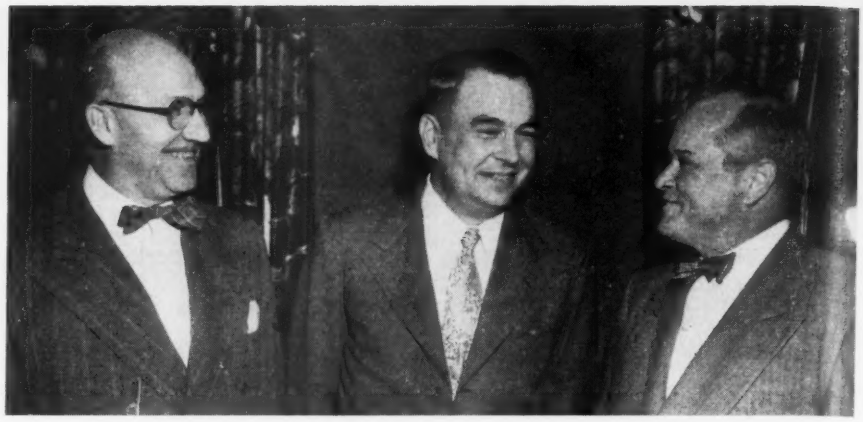
APPROXIMATELY 100 members and guests attended the Nov. 19 meeting of the Pittsburgh Foundrymen's Association held at the Fort Pitt Hotel with O. Edwin Decker, president, presiding.

A. P. DeVita, sales manager, Robins Conveyor Division, Hewitt-Robins Inc., New York, discussed "Preventive Maintenance in the Foundry." In the speaker's opinion, preventive maintenance is a system for taking precautions against trouble in advance. The advantages of good preventive maintenance are: Production rolls continuously with a minimum of down time; unit production costs are reduced; replacement and repair costs are similarly reduced; and spare parts inventories can be kept at a minimum through advance planning.

There are probably a number of good systems that can be set up. Mr. DeVita recommended keeping charts on every important machine; these should be checked daily to insure that inspections are made when due. Any trouble reported should be corrected at the first available time that can be arranged with production people. Any extra labor cost that may be involved in using good, mechanically-minded men in a preventive maintenance group is well worth the expense. In closing, Mr. DeVita stated that inspection, lubrication and immediate repair can go a long way toward stretching our national resources and our available plant supply.

The following have been appointed to serve as an Educational committee to make a thorough study of the future of the industry regarding trained technical men and present its recommendations within a reasonable time: H. B. Reed, Westinghouse Airbrake Co.; Frank H. Reuwer, Westinghouse Electric Corp.; Harold Gassner, Rosedale Foundry & Machine Co.; and A. R. Barbour, Roessing Bronze Co.

Next meeting of the association will be held Jan. 21 at the Fort Pitt Hotel. Clyde Sanders, vice president, American Colloid Co., Chicago, will discuss, "How Can Molding Sand or Molding Procedure Influence Metal Shrinkage?"—*Dan Reebel*

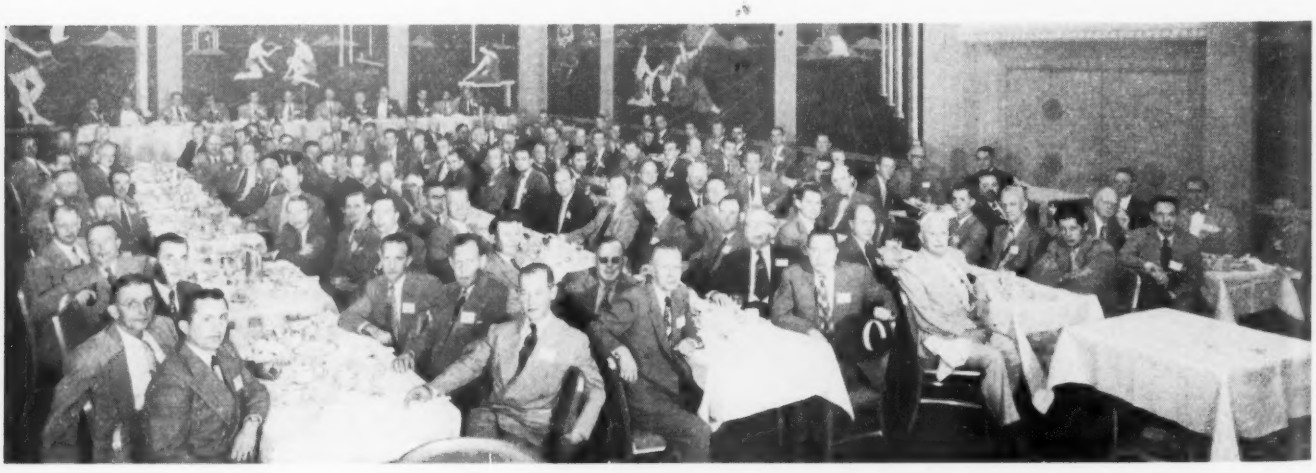


CENTRAL ILLINOIS Chapter of the AFS met Nov. 5 to hear George Anselman (center), Beloit Foundry Co., Beloit, Wis., speak. At left is Henry Felten, Peoria Malleable Castings Co., technical chairman. A. V. Martens, Pekin Foundry Co., is at right. Photo by Fred Brosmer, Caterpillar Tractor Co.

Central Illinois

SPEAKER at the Nov. 5 meeting of Central Illinois Chapter of the AFS was George Anselman, vice president, Beloit Foundry Co., whose subject was "Molding and Core Sands." Henry Felten, Peoria Malleable Castings Co., served as technical

(*Continued on page* 180)

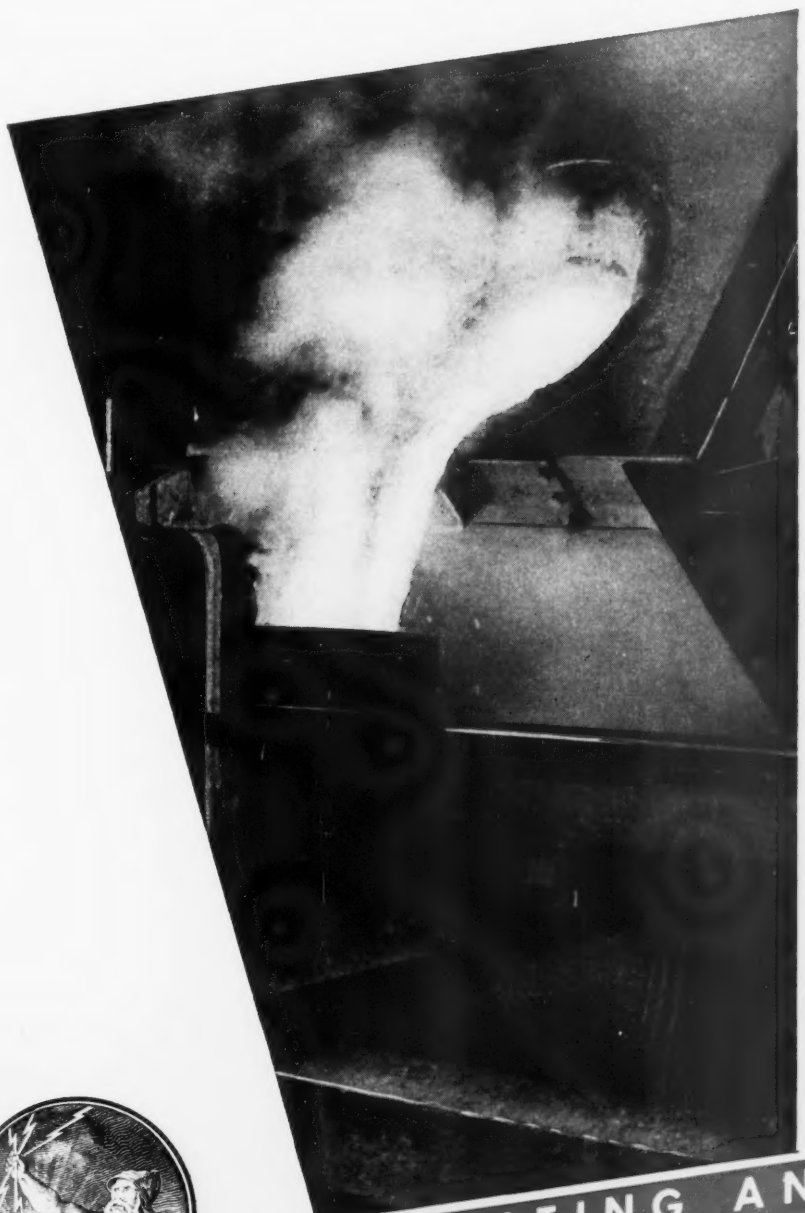


Luncheon session, Oct. 19, during the second annual Texas Regional Foundry Conference at Houston

Alloy savings

PAY FOR AJAX-NORTHRUP FURNACES

in three years



Induction melting saves tons of ferrochrome a month in one east coast stainless steel foundry . . . metal that was previously "burned up" in other electric furnaces.

With a three shift monthly melting capacity of 1,000,000 pounds, a 2% reduction in chromium losses made the difference. Dollar savings up to $60,000 a year are enough to pay for the equipment in a year and a half—three years on a reduced schedule.

This is only the beginning—savings in other critical and expensive alloys are also appreciable. Here are typical metal recovery figures from another Ajax-Northrup foundry melting 18-8 stainless:

Ni:	100%	Cr:	99%	Mn:	90%
Si:	94%	Mo:	95%	Cb:	92%

Besides saving metals, Ajax-Northrup furnaces melt at high speed, with extremely close control of analysis and temperature. A typical foundry, with never more than one 600-pound furnace in operation on a two shift basis, pours almost 250,000 pounds of high-melting point alloys a month. Pouring temperatures are controlled within 20°F, composition of every element within 0.25%

Performance like this can save critical alloys for you, too. Whether you melt 8 ounces of platinum, or 8 tons of steel, write us today.

SEND FOR NEW INDUCTION HEATING AND MELTING BULLETIN

140.

FOR HEATING AND MELTING

AJAX NORTHRUP

AJAX ELECTROTHERMIC CORPORATION

AJAX PARK
TRENTON 5, NEW JERSEY

Associate Companies

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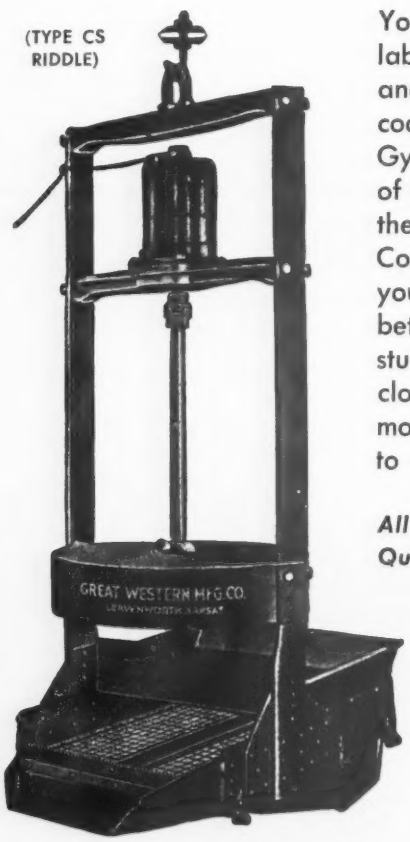
AJAX ENGINEERING CORPORATION

For THRIFTY and SWIFT SCREENING COMBS Gyratory FOUNDRY RIDDLES

Sifts-Mixes-Fluffs-Aerates Up to 30 Times Faster

(TYPE CS RIDDLE)



You can save up to 90% of your labor costs in screening moulding and core sands, medium fine and coarse dry materials with a Combs Gyratory Riddle. Doing the work of 10, 20, or 30 men, depending on the type and model you choose, Combs Foundry Riddles also give you a better mixed, better aerated, better screened material. They are sturdy, simple to operate, fully enclosed, and fractional horsepower motor costs less than 1c an hour to run.

All Combs Foundry Riddles Have Quick Removable Steel-Rim Sieves.

Type CS (Illustrated) has automatic discharge of gaggers, refuse, etc. Lets man do continuous shoveling. Only $320.00 f.o.b.

Type "V" (20" screen) and **Type "V-5"** (36" screen) have 10 and 30 manpower capacity respectively.

Prompt Delivery from Your Foundry Supply House

Send for FREE Descriptive Folder

(*Continued from page* 178)

chairman.

Mr. Anselman discussed in general the importance of proper handling of the various types of sand and explained his theory of using the same fineness of sand throughout the coreroom and foundry to eliminate any chance of mixing various types of sand on the molding floors. By using this method they use the same fineness of sand for all types of molding regardless of size and weight of the casting.—*G. F. Lloyd, Brass Foundry Co.*

Reading

REGULAR monthly meeting of the Reading Foundrymen's Association was held at the Berkshire Hotel, Reading, Pa., Nov. 20. President George C. Kissell presided and there were 100 members and guests present.

The association's Jan. 15 meeting will feature two roundtable discussion groups. That on brass and bronze is to be handled by Robert Colton and Donald LaVelle, American Smelting & Refining Co., Perth Amboy, N. J. The iron group will have Charles Mooney and Clif Merket of the Olney Foundry Division, Link-Belt Co., Philadelphia, as discussion leaders.

The November meeting's principal speaker was Fred G. Sefing, International Nickel Co., New York, who spoke on the "Why of Gate and Feeder Design." He stressed principally the importance of keeping in mind progressive solidification when arranging the gates and risers. Using slides to illustrate his text, Mr. Sefing showed several different gating arrangements. There was a magnesium casting in which he suggested an aluminum screen be used to retain the dirt. He also indicated preference for the runner to be in the cope and the gates to come off the drag so that any dirt would flow to the top. A horn gate was illustrated on a manganese bronze casting. The design showed two down sprues—one to pour through and one to act as a trap for dirt. The horn gate also had a skimmer and fed to the bottom of a riser thereby insuring hot metal at the correct place.

The question which always arises is how large must a riser be; how much metal will be drawn back into the heavy part of the casting? It is estimated that approximately 3 lb metal will be needed for every 10 lb of casting when there is no core expansion. Since a riser is from 25 to 40 per cent efficient, a riser should be big enough to be effective.—*Joseph Grenko, Textile Machine Works.*

No. Illinois and So. Wisconsin

DESIGNATED International Night, the Nov. 13 meeting of Northern Illinois-Southern Wisconsin Chapter of the AFS was held at the Beloit Country Club, Beloit, Wis. Frank W. Shipley, foundry manager of Caterpillar Tractor Co., Peoria, Ill., and a director of AFS, spoke briefly on the coming AFS International Foundry Congress and Show.

Chairman Carl Dahlquist introduced the technical speaker of the evening, Bradley H. Booth, Carpenter Bros. Inc., Milwaukee, whose topic was "Sands." Mr. Booth believes all foundrymen should be familiar with the AFS publications, *Foundry Sands and Clays* and *Analysis of Casting Defects*. He also maintained that too much or too little moisture causes a great number of casting defects and stressed the importance of sand testing in the production of quality castings.—*J. S. Zabel, Zabel Foundry Sales Inc.*

Meehanite Manufacturers Hold Research Meeting

Meehanite Metal Corp., New Rochelle, N. Y., held its annual research meeting in New York, Nov. 7-10. Over 150 representatives of Meehanite foundries in the United States, Canada, and Mexico heard the presentation of 40 papers dealing with management, product development, foundry practice, engineering, metallury, and casting sales.

Announcement was made that DeLaval Steam Turbine Co., Trenton, N. J., has become one of the company licensees and that Meehanite Metal Co. of Japan Ltd., has been formed under agreement with Mitsui Shipbuilding & Engineering Co.

Offers Shrink Tables

Decimal equivalents, corrected to four places, for all dimensions from 1/64 to 12 in., compensated for known shrinks in ferrous and nonferrous metal or plastic materials, are included in a book recently published by Arrow Pattern & Engineering Co., Box 823, Erie, Pa. It provides a method of checking or establishing accurate measurements in producing patterns, dies, and other equipment for making castings in sand, permanent molds, dies, or shell molds.

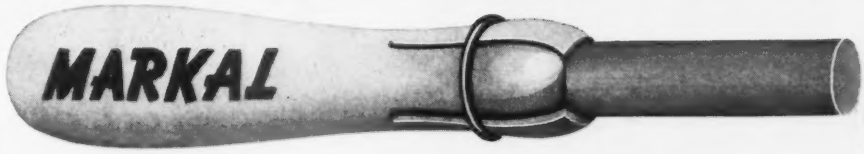
Page size of 11 x 15 in. permits listing the 768 readings for each shrink in clear, columnar form. One page is devoted to each of 17 shrinks from 1/32 to ½-in. inclusive. Books are available from the company at $1 each.

POSITIVE MARKS THAT ARE

PERMANENT
FADE-PROOF
WEATHER-PROOF

are made with the

MARKAL PAINTSTIK



* Makes permanent marks. Any surface. Special types for marking *cold*, rough, castings, billets, ingots, pigs, etc. Paintstiks engineered to your specific marking requirements. We like to hear about special marking problems. Write for FREE SAMPLE.

MARKAL CO. 3056 W. Carroll Ave. Chicago 12, Ill.

"There's no substitute for the original MARKAL PAINTSTIK"

Markal Co.
3056 W. Carroll Ave., Chicago 12, Ill.

Please send me a FREE SAMPLE Markal Paintstik. I want to see for myself if the marks it makes on hot or cold surfaces are FADE-PROOF, WEATHER-PROOF and RUB-PROOF.

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Company _____

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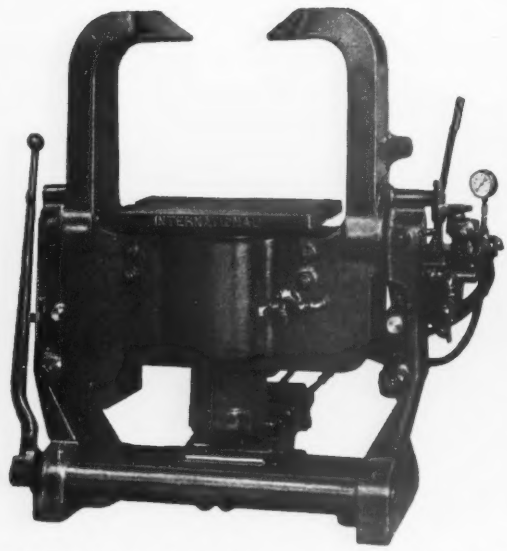
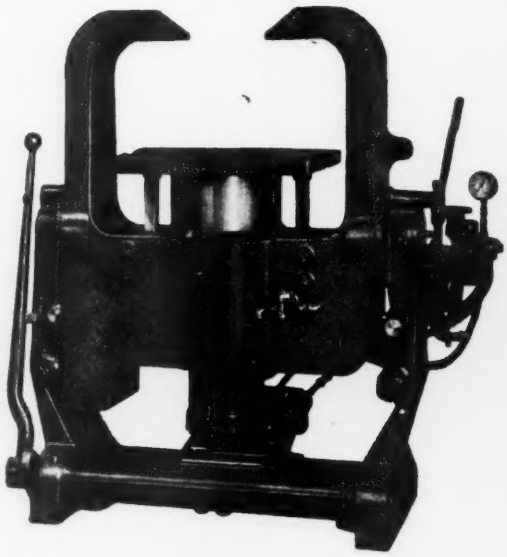
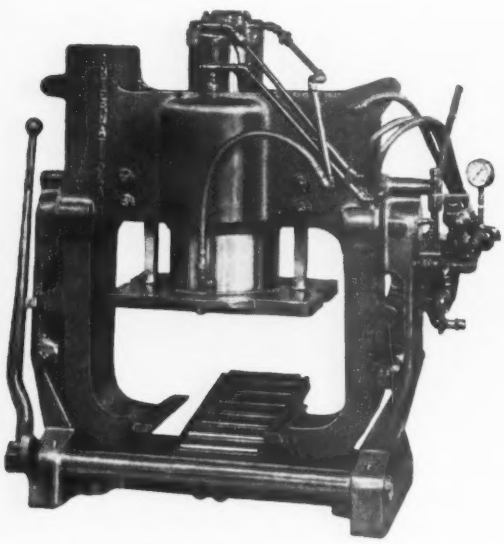
OPERATING CYCLE OF THE RES MACHINE



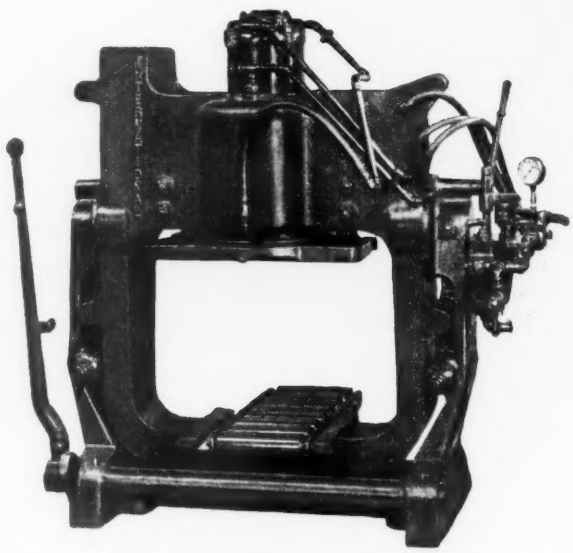
1 JOLTING POSITION . . . ready for flask, sand and jolting. Strike-off and place bottom board on sand.



2 SQUEEZE POSITION . . . actuation of squeeze valve raises squeeze piston, thereby squeezing the mold and clamping the bottom board and flask into one integral unit, ready for rollover.

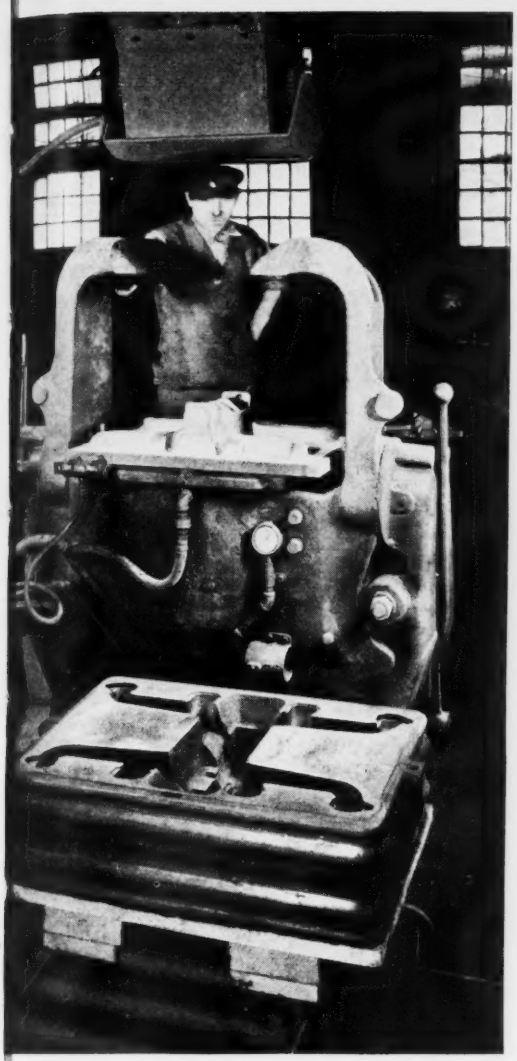


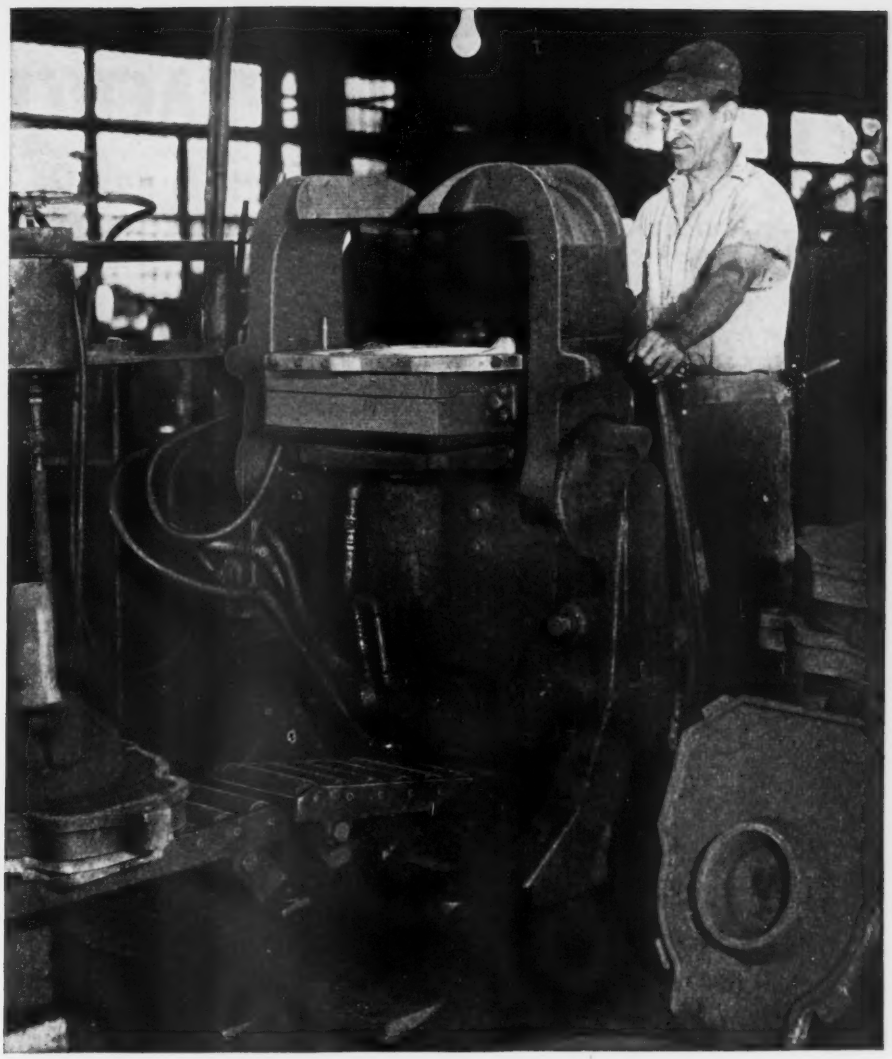
3 ROLLOVER POSITION . . . a slight pull of rollover frame by hand, rolls the machine over ready to operate the draw.



4 DRAW POSITION . . . by actuation of the vibrator valve and draw valve, the pattern is drawn from the mold. Rollers are then raised and mold pushed out by foot.

INTERNATIONAL





Features of the Type RES Machine

The fastest type Jolt, Squeeze, Rollover, Draw Machine.

Draw is always true because of integral frame and draw feature.

Completely above floor line . . . no pit necessary.

Engineered for ease of maintenance.

The **Type RES** is designed, as are all machines in the INTERNATIONAL LINE, by experienced foundry engineers who have a practical working knowledge of the problems of the business.

Inquiries should specify maximum outside width and length of the largest flask to be used, including trunnions and handles, allowance required for depth of flask, pattern plate and bottom board and amount of draw required.

MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

STEEL CASTING PRACTICE DEVELOPMENTS

Discussed at T. and O. Conference

IMPORTANCE of research and developmental activities as the key to continuing advances in the steel casting industry was emphasized at the sixth annual Technical and Operating Conference of Steel Founders' Society of America, held at Hotel Carter, Cleveland, Nov. 8-10. Attendance of 420 set a record high.

More than 25 technical papers, individual and roundtable discussions arranged by Charles W. Briggs, technical and research director, and the society's 11-man national Technical and Operating Committee, were presented.

As chairman of the national committee, Luther A. Kleber, vice president in charge of manufacturing, General Steel Castings Corp., Granite City, Ill. opened the conference with reference to the importance of continuing close co-operative effort of T. & O. groups at divisional and regional levels, and commended the diligence of those responsible for and participating in the program.

First technical session was devoted to sand reclamation systems, with Hubert Chappie, foundry superintendent, National Supply Co., Torrance, Calif., and James J. Blauch, chief inspector, Lebanon Steel Foundry, Lebanon, Pa., presiding.

Launching the session, J. A. Rassenfoss, research metallurgist, American Steel Foundries, East Chicago, Ind., spoke on "Flowability Tests for Steel Molding Sands." The paper, prepared jointly by Mr. Rassenfoss and L. N. McKibben, dealt with determination of flowability characteristics of various sand mixes, selection of test castings and mold preparations, comparison of the flowability qualities of new, used, and reclaimed sands, and the effect of additives.

He concluded that no laboratory test has been found of suitable sensitivity and reproducibility for quantitative measurement of sand flowability: The simplest and most reliable judge of sand flowability is still the surface finish of a critical test casting. With such a test casting, it has been demonstrated that bentonite bonded molding sand mixes made with washed reclaimed and new crude Ottawa sands have similar flowability. A mold sand mixture made with heap sand is much less flowable than the washed reclaimed and crude sand mixtures.

Effective and economical "Hydroblast Reclamation" was described by D. E. Meves, chief metallurgist, West Michigan Steel Foundry Co., Muskegon, Mich.

Mr. Meves stated that reclaimed sand can produce castings as satisfactorily as new sand, under proper quality control supervision, and material savings are shown in a statistical breakdown of accumulative operating cost.

Similarly practical and profitable reclamation operation on a larger scale was outlined in the joint paper of K. S. Howard, vice president, and C. B. Jenni, chief metallurgist, General Steel Castings Corp., Eddystone, Pa., "Sand Reclamation at the Eddystone Plant." Their problem was to produce a product which could be used interchangeably with new sand for both core and mold facings.

The combined wet and thermal process of reclamation was adopted and a plant designed for 100 net tons per day output was subsequently installed. He quoted cost figures to show economies realized through use of the system Furthermore, according to Mr Jenni, the method is effective regardless of the combination of binders and other additive materials used in mold or core sand formation.

In "Pneumatic Reclamation for Foundry Sands," C. E. Wenninger, director of foundry research and development, University of Kentucky, Lexington, presented a discussion of dry "air-scrubbing" methods as reflected in cumulative laboratory experimental and practical development work.

Recognition of the importance of correct design and technical collaboration by steel foundry and design engineers was emphasized by Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., and chairman of the society's Product Development Committee, in introducing W. T. Bean, Jr., consultant, Detroit, who spoke on "Strain Gages in Steel Casting Design." Good structural design, he stressed repeatedly, is definitely compatible with good foundry practice. The value and importance of the use of strain gages and related equipment for analysis, evaluation, and improvement of casting design were emphasized.

LUTHER A. KLEBER
Chairman
Technical and Operating Committee

Boron and alloy conservation was the subject of discussions in ensuing sessions led by G. A. Lillieqvist, research director and chief metallurgist, American Steel Foundries, East Chicago, Ind., and co-chairman T. J. Nichols, vice president in charge of operations, Fort Pitt Steel Casting Division, Pittsburgh Steel Foundry Corp., McKeesport, Pa.

Technical papers were read by the following: "Boron in Steel Castings," A. H. Suckow, metallurgist, Symington-Gould Corp., Depew, N. Y.; "Boron and Alloy Conservation," E. H. Berry, chief metallurgist, Dodge Steel Co., Philadelphia; "Effects of Boron in Cast Steels," R. W. Zillmann, research metallurgist, Pittsburgh Steel Foundry Corp., Glassport, Pa.; "The Substitution of Boron for Alloys in Cast Steel," C. K. Donoho, chief metallurgist, American Cast Iron Pipe Co., Birmingham; "Boron Treated Cast Steels," W. R. Punko, metals superintendent, Wehr Steel Co., Milwaukee; "Alloy Conservation," V. E. Zang, vice president in charge of research, Unitcast Corp., Toledo, O.; and "Resume of Boron Treated Cast Steels," C. W. Briggs, technical and research director of the society.

Cleaning room practices, with emphasis on recent equipment developments and control of costs, were the subject of sessions conducted by C. E. Silver, works manager, Texas Electric Steel Casting Co., Houston, Tex.; and M. T. MacPherson, plant engineer, Symington-Gould Corp., Depew, N. Y.

Flame gouging by the oxyacetylene process for the removal of excess material or defects from steel castings can be both economical and efficient, it was shown by James J. Blauch, chief inspector, Lebanon Steel Foundry, Lebanon, Pa., in a paper on "Flame Washing and Gouging." Hubert Chappie, foundry superin-

(*Continued on page* 186)

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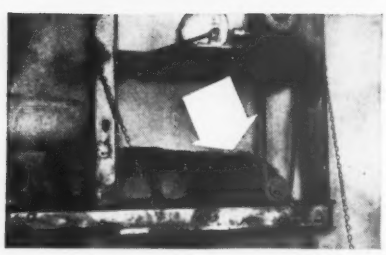

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(*Continued from page* 184)

tendent, National Supply Co., Torrance, Calif., in discussion of the "Arcair Process," described metal removal with a gouging and cutting torch which utilizes a carbon electrode and compressed air and operates on an ordinary 300-400 ampere dc welding machine.

Arc-jet removal of casting defects and preparation for welding was discussed in a paper on "Kwik-arc Jet Torch," by F. J. Stanley, works manager, McConway & Torley Corp., Pittsburgh.

Speaking on the subject, "Reducing Cut-Off Costs," R. J. O'Connor, foundry superintendent, Cooper Alloy Foundry Co., Hillside, N. J., said that production experience of the company indicates that use of the friction saw is an efficient and economical method for gate and riser removal in stainless steel castings weighing up to 80 pounds.

Cut With Oxygen

C. R. Genung, metallurgist, Ross-Meehan Foundries, Chattanooga, Tenn., followed with discussion of "The Use of High Purity Oxygen in Flame Cutting Steel Castings." Company experience indicates that the method may increase the cutting rate by as much as one-third in the hands of competent workmen.

Use of the pneumatic edge grinder to effect reduced cleaning costs was outlined in a paper, "The Removal of Fins by Grinding," by T. W. Peacock, assistant superintendent, Florida Machine & Foundry Co., Jacksonville.

Victor E. Zang, Unitcast Corp., Toledo, O., was chairman of an afternoon panel discussion. G. A. Lillieqvist, American Steel Foundries, Chicago, was vice chairman. Heading the panel of judges was Dale Hall, works manager, Oklahoma Steel Castings Co. Inc., Tulsa; assisted by H. H. Johnson, metallurgist, National Malleable & Steel Castings Co., Sharon, Pa.; W. T. Bland, superintendent, Commercial Steel Casting Co., Marion, O.; William Robertson, general foreman, Strong Steel Foundry Co., Buffalo; and A. L. Proctor, Bethlehem Steel Co., Bethlehem, Pa.

On the technical group panel were H. H. Blosjo, metallurgist, Minneapolis Electric Steel Castings Co., Minneapolis, chairman; R. S. Haught, metallurgist, Sawbrook Steel Castings Co., Cincinnati; J. D. Fraser, quality control engineer, National Malleable & Steel Castings Co., Cicero, Ill.; C. D. Pruesch, foundry metallurgist, Crucible Steel Co. of America, Harrison, N. J.; and C. E Shaw, works engineer, American Steel Foundries, Alliance, O.

Members of the operating panel

(*Concluded on page* 188)

Scrap losses decreased as much as 50%

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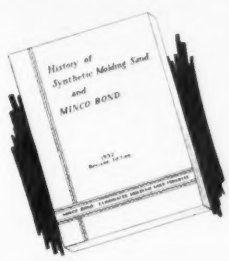

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2. **GOOD GREEN STRENGTH** (at all workable moisture ranges).
3. **HIGHEST COLLAPSIBILITY** (which increases flow of castings thru shakeout and cleaning equipment. Reduces shakeout and cleaning costs).
4. **HIGHEST DRY STRENGTH** (no other bond in the foundry ry world will give you high dry strength combined with high collapsibility and flowability. MINCO BOND does).
5. **MEDIUM HOT STRENGTH** at pouring temperatures. (Eliminates cracked castings.) Excellent for malleable.
6. **HIGH DURABILITY** (which still further reduces costs).
7. **HIGHEST INSULATING VALUES OF ALL FOUNDRY BONDS.** This most valuable insulating property cools molten metal slower allowing gases in the metal to escape before the metal sets. This reduces the machine shop losses. Tends to eliminate hard spots in castings. Improves machinability of castings.
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9. **THE USE OF MINCO BOND** will not lower permeability.
10. **INHIBITS THERMITE REACTION** which eliminates casting blows.
11. **MAKES SMOOTHER CASTINGS.**
12. **A NEUTRAL MINERAL** having a pH of 7.5 (will not foul up heaps or systems when in long, continuous use).
13. **MINCO BOND IMPARTS ALL ITS FAVORABLE QUALITIES TO ANY OTHER BOND WITH WHICH IT IS USED.**
14. Because of the above characteristics of **MINCO BOND**, its use increases the production of castings at least 10%.

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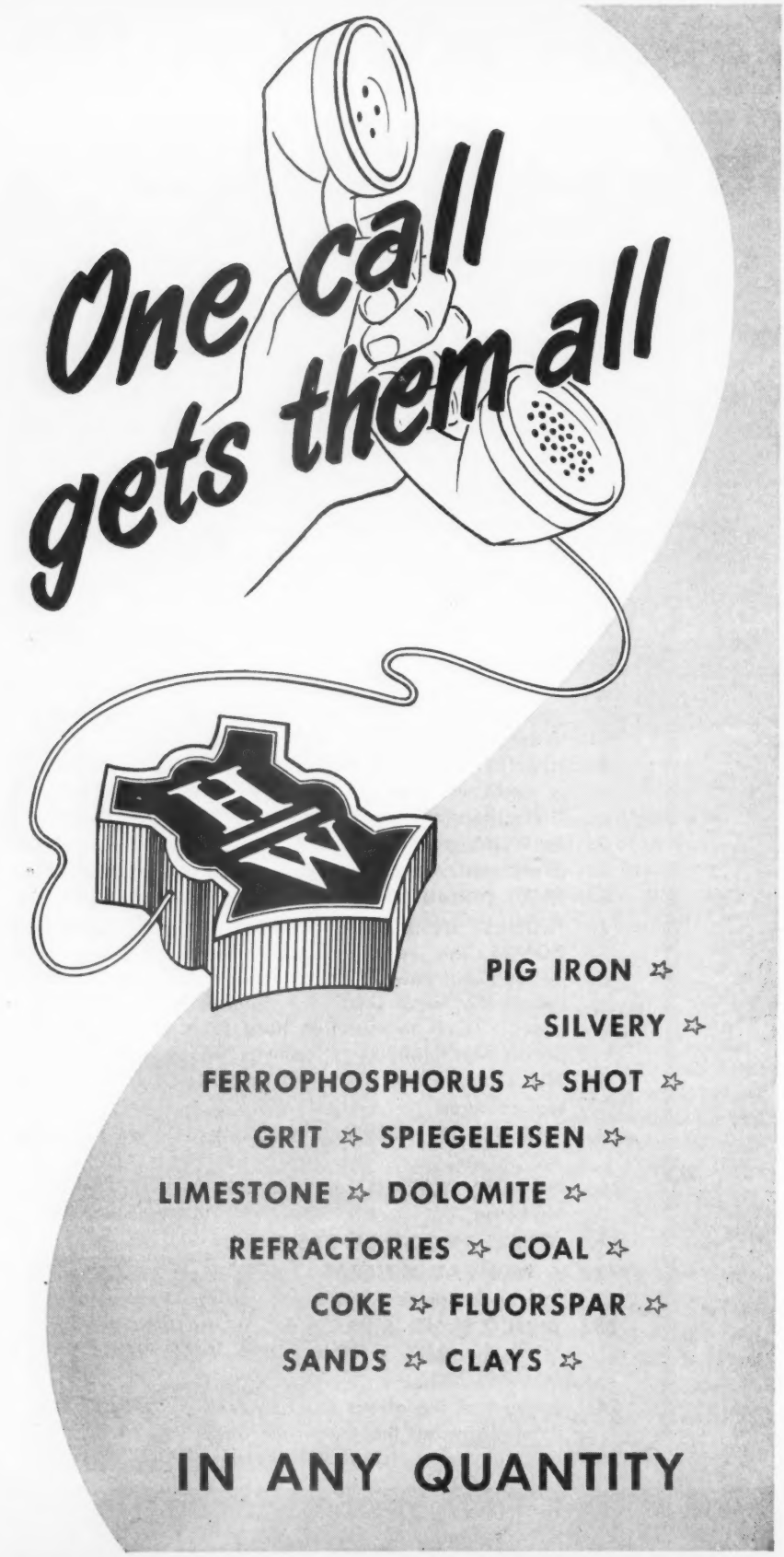

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(*Concluded from page* 186)

were Walter W. Moore, works manager, Burnside Steel Foundry Co., Chicago, chairman; Carl Goodgion, chief metallurgist, Service Foundry Inc., New Orleans; L. J. Venne, assistant works manager, American Steel Foundries, Alliance, O.; F. T. Reska, foreman, General Electric Co., Foundry Division, Everett, Mass.; and O. K. Buckner, purchasing agent, Electric Steel Foundry Co., Portland, Ore.

Final sessions were devoted to new equipment and methods. F. W. Ladwig, foundry manager, St. Louis Steel Casting Co., St. Louis, presided as chairman, assisted by J. J. Blauch, chief inspector, Lebanon Steel Foundry, Lebanon, Pa.

Adaptation of a combination skid and shakeout basket and utilization of a special type of squeezer mold dumping device were described in a joint paper on "Methods of Handling Molds after Pouring," by C. E. Silver, Texas Electric Steel Casting Co., Houston, and P. H. Stuff, chief metallurgist, Ross-Meehan Foundries Inc., Chattanooga, Tenn.

"Shockless Jolt Machine Molding," as successfully carried out in the East St. Louis plant of American Steel Foundries, was explained by H. H. W. Arendes, industrial engineering supervisor.

Use Floating Core

Advanced methods of product design were described by R. J. Franck, product engineer, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.

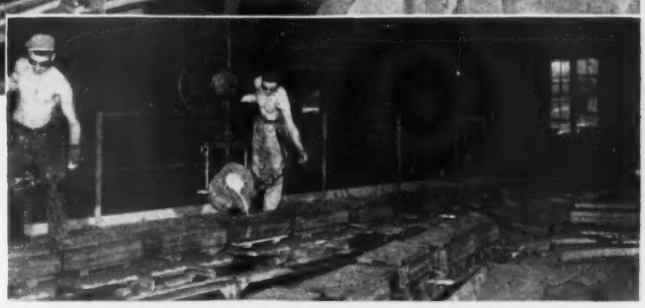
R. L. Edmiston, superintendent, Sterling Steel Casting Co., East St. Louis, Ill., described the foundry's experience in use of "The Floating Core," as a practical and effective means of reducing eventual cleaning costs—by baffling out dirt and foreign matter normally passing from sprue to riser in pouring a mold.

Experiments with expanding plaster to form master patterns were described by S. B. Leath, pattern superintendent, and B. A. Lawson, chief metallurgist, Harrison Steel Castings Co., Attica, Ind.

"Fly Ash as a Pipe Eliminator" in the promotion of increased riser efficiency was the subject covered by P. C. Fuerst, assistant foundry superintendent, Falk Corp., Milwaukee.

G. C. Detlefsen, works manager, Crane Co., Chicago, spoke on "Turbo-Drive Operation and Application," a pneumatic pipeline conveying system for handling bulk material.

"Batching Foundry Sand by Electronic Weighing" was discussed by V. E. Lich, assistant mechanical superintendent, General Steel Castings Corp., Granite City, Ill.



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Large photo—general view of mechanized foundry. Directly above—same shop showing pouring stations.

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Whether your foundry is large or small, we will be glad to help you improve operations—make lay-outs if necessary—to prove that mechanization pays off. Write today.

Uphill or downhill makes no difference with Jeffrey mold conveyors. Note automatic dumper—no men needed here.

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Adventures of BILL

By PAT DWYER

Illustrations by RICHEY

WHILE enjoying a pipeful of my tobacco the other night, Bill inquired if I ever had entertained the idea of owning and operating a small neighborhood store. I admitted that at one time or another I had toyed with the idea of quitting the foundry business and taking up some line where the mental and physical effort was negligible and where the income was regular and on a higher scale. Natural curiosity prompted me to ask Bill why he had brought up the subject.

"Well," he said, "I'll tell you. One day a few weeks ago a very smooth and gabby gent tried to interest me in the purchase of a small corner store on the west side of town. He painted such a glowing picture of the many attractive features—no work, no trouble, no headaches, a constant stream of money pouring in and only a small amount going out—that I almost was convinced that here was my opportunity for a life of affluence, ease and comfort."

"So now you own a store?"

"You might say the same way as I own a castle in Spain. While buying a paper of tobacco next day in a somewhat similar store, the prorietor saw fit to cry on my shoulder.

" 'You have no idea,' says he, 'what I am up against in this here joint. I don't mean the grownup folks, although some of them give me the pip. I could give you the names of a few birds around here—male, female and neuter—who must have been designed by Providence originally as gadflys. I am not a Hindu and don't know much about this here now transmigration stuff, but I am willing to bet any reasonable amount up to six bits that in a former state of existence several of my customers carried spears and poison sacs and were members in good standing in the ancient and vicious tribe of Misskitties.

" 'Some of these people would try the patience of a canonized saint. But the kids! Say: I know old Herod started on them pretty young, but believe me he had the right dope and I am for him, strong.

" 'Young imps come in here with a nickel gripped in their grimy little paws and take up half an hour of my time while they are making up their muddy little minds how they are going to spend it to the best advantage for themselves. They insist on being shown practically everything in the store although they know perfectly well—and I know just as positively—that eventually they will depart with an all-day sucker on which my profit is approximately one-tenth of 1 per cent. Business? This is not a business at all. It is nothing but a gamble with me on the short end of the stick. For example, consider my experience one day about a year ago.

" 'Just before Valentine day I laid in a stock of penny valentines. You know the horrible daubs our dear little rising generation loves to send anonymously to teachers and other dear and loving friends. I confidently anticipated a modest profit on the collection. I arranged an attractive display in a large open box where any normal person could examine them and make a selection without disturbing the whole outfit. The vanguard or, perhaps more properly speaking, a few scouts from the school army came dribbling in at noon time and looked them over. They edged up pretty close, but the instant I saw them dipping their hands into the collection I chased them out through the door.

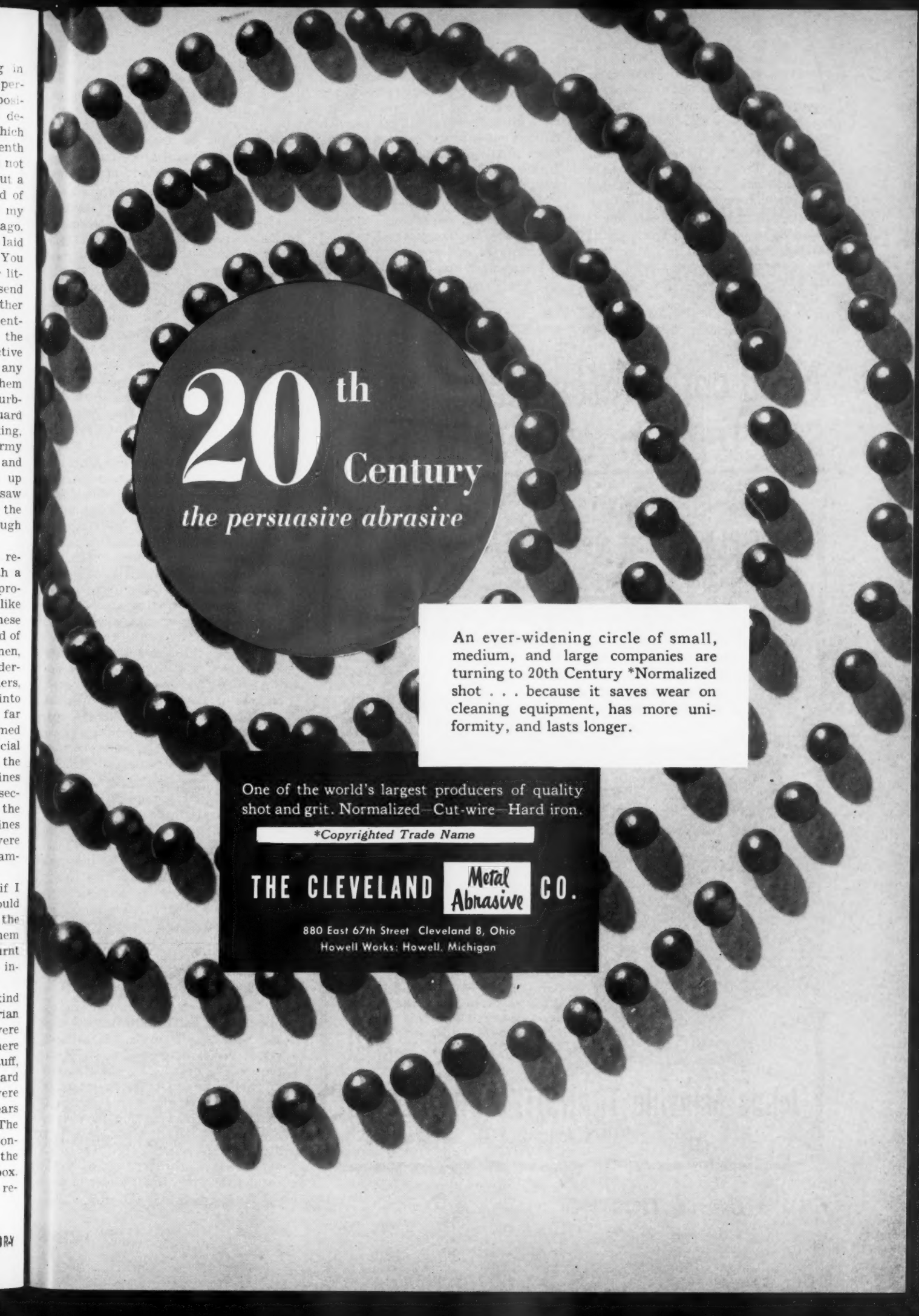
" 'After school hours the scouts returned with reinforcements. With a joyous and combined yelp they proceeded to surround the box. I like to see enthusiastic customers. These lads were too enthusiastic. Instead of each lad quietly selecting a specimen, paying for it and retiring in an orderly manner to make room for others, the whole mob dipped its paws into the collection at one time. So far as I could see the young imps seemed to think I had arranged a special game for their benefit, in which the object was to snatch the valentines from each other. In about three seconds by any reliable stop watch the box was empty. Half the valentines were torn and the remainder were scattered all over the floor and trampled under foot.

" 'I give you my solemn word if I had my wish at the moment I could have taken the whole gang out in the middle of the lake and dropped them overboard with a couple of burnt grate bars tied to each of their individual villainous little feet.

" 'I dropped in amongst them kind of promiscuous, like that Assyrian bird in the story whose cohorts were gleaming with purple and gold. There wasn't much purple and gold stuff, but when I rapped some of their hard little knobs together, I bet they were reminded of the sheen of the spears like stars over calm Galilee. The band remained discreetly at a reasonable distance while I gathered the papers and replaced them in the box. Then I invited the young cubs to re-

(*Continued on page* 192)

A lull in the day's occupation that is known as the children's hour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An ever-widening circle of small, medium, and large companies are turning to 20th Century *Normalized shot . . . because it saves wear on cleaning equipment, has more uniformity, and lasts longer.
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(*Continued from page* 190)

turn two at a time to make their selections. The first lad picked up a repulsive valentine that appealed to his depraved taste and tendered me a nickel in payment. He clumsily dropped the coin, whether by accident or design I don't know, but I have my suspicions. The coin rolled into the open hot air register in the floor.

" 'Well, a nickel is a nickel. While I was on my hands and knees trying to retrieve it, I looked up just in time to see the second young vandal shoving half a dozen valentines up inside his dear little blouse. I grabbed him by one of his bat ears and dragged him to the door. I chased the remainder of the gang out after him and then took all the torn and half torn valentines out into the yard and burned them in the waste paper incinerator. Business! Say, mister, there ain't no such animal no more.'

"I expressed my sincere sympathy," Bill continued, "over the conditions with which the store owner was surrounded, and at the same time warmly commended him on the prompt and decisive manner with which he had handled a delicate situation. In fact, I regretted exceedingly that I had not been present to witness the engagement and the total rout of the enemy. However, the entire episode threw a lot of light on the store situation, and effectively cured me of any desire to own and operate one of my own.

"Apparently these here store keeping fellas have their own troubles. Heretofore I had a general impression that foundrymen had a monopoly along that line. I had an inquiry recently from a man who wrote that he was engaged primarily in the manufacture of cast bronze and aluminum signs, plaques, mail boxes, house numbers, etc. Castings are made in sand molds. One of his customers has asked him to cast several life-size busts of locally prominent men. He would appreciate any information on the foundry technique employed in this branch of the foundry industry.

"Methods and equipment employed in foundries that specialize in the production of statuary and other forms of ornamental bronze and aluminum castings have been described in FOUNDRY on many occasions. Two principal methods are employed. In one known as the lost wax method, a plaster cast is taken from a clay model or pattern. A thickness of wax is painted on the plaster face, or attached in the form of wax sheet, the desired thickness of metal. The inside then is filled with plaster and the entire mold is placed in an oven, regular or improvised, and raised to a red heat. The wax melts and runs out through suitable openings at the bottom. The mold is removed from the oven and filled with molten metal.

"In the second method, in which presumbly you are more interested, the casting is made in a sand mold. In this method also the first step involves the production of a clay model or pattern. This part of the work lies outside the foundry field and is done by an artist or sculptor with the necessary training, experience and equipment. Since the facilities in a studio are greater than those in a foundry, the sculptor usually continues the work and supplies the foundry with a plaster pattern.

"The pattern is bedded down approximately half way in a false cope and a parting is made. Small individual bodies of sand, known in the foundry as drawbacks, are rammed in undercuts and other indentations. The drag part of the mold then is rammed full of sand and the assembly is rolled over. The false cope is lifted off and shaken out. The parting face is touched up, and as in the case of the drag, small bodies of sand

(*Continued on page* 194)

Need core plates that SPEED PRODUCTION?

. . . then use TRANSITE CORE PLATES that are light-weight and easy to handle

You'll find two important reasons why Transite* Core Plates mean faster production: First, core makers can handle more plates with fewer trips. Second, Transite Core Plates are easier to clean . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

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Here are more *reasons why you can profit by using Transite Core Plates:*

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For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details write Johns-Manville, Box 290, New York 16, N. Y.

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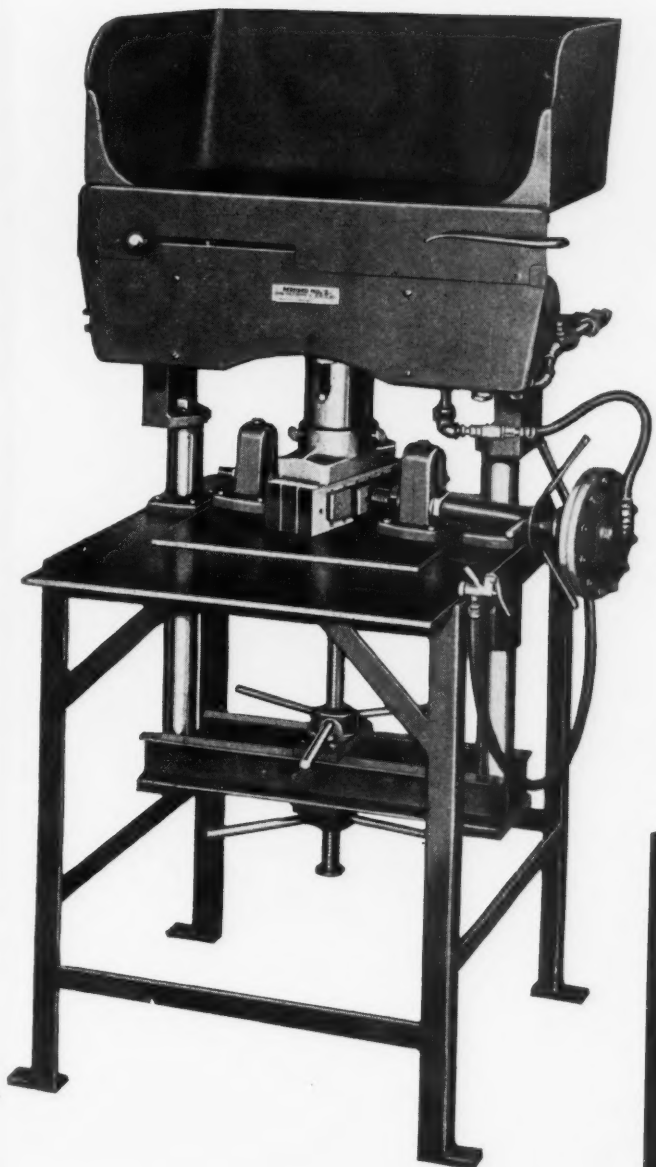
Made of Asbestos

Redford CORE BLOWERS



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New standards are being set with this machine, because every motion of your operator has been correctly evaluated to obtain a maximum of production with a minimum of effort.

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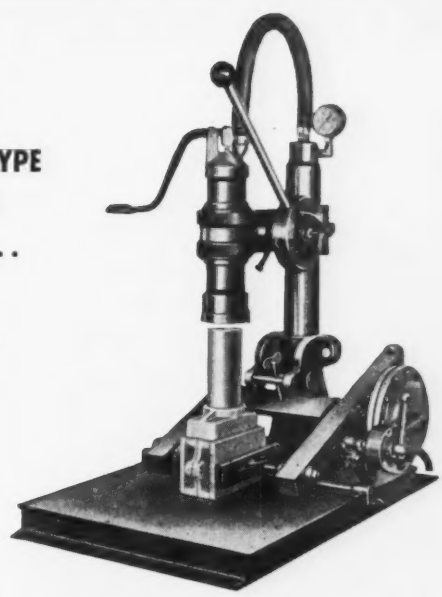

The original small core blower . . Proven simplicity, speed and flexibility. Makes cores up to 2#.

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(*Continued from page* 192)

are rammed in the undercuts. The cope then is rammed and lifted off. The small bodies of sand are removed sideways from the pattern and attached in proper place on the cope face.

"The pattern is removed from the drag. An arbor built up of steel rods wired together is fitted in the drag mold. Several rods extend from the arbor and rest in indentations in the joint face of the mold. These rods are designed to serve as chaplets which support and hold the core in place when the mold is filled with metal. Sand is rammed in, around and above the arbor and then the cope part of the mold is returned to place on the drag. Through the open end of the mold sand is rammed in to fill the space in the cope. A sand print is built up around the open end.

"The assembly is clamped or bolted and rolled over . The drag is lifted off and set down on its back. The loose pieces or drawbacks are removed from the exposed face of the core and attached in proper place on the drag face. Large head tacks are pushed into the core face a few inches apart with the heads flush with the sand. The tacks serve as a guide while the molder cuts away a thickness of sand corresponding to the desired thickness of metal, all over the face and down to the parting line. The tacks are removed and the face of the core is slicked over with the tools. The trimmed core face is sprayed with blacking, or in some instances is covered with dry plumbago applied with a camels-hair brush. The drag is replaced on the cope and the assembly is rolled over for the last time.

"The cope is removed and the exposed face of the core is thumbtacked. A thickness of sand corresponding to the desired thickness of metal in the anticipated casting is removed as in the former instance. At this stage the core does not touch either top or bottom face of the mold. It is supported by the large print at the open end and by the extended rods from the arbor which rest on the joint. The cope then is put back in position.

"In some instances it may be advisable to dry the entire mold in the oven. In other instances the faces of the mold and core may be skin dried with a gas or oil torch or with charcoal fires. In certain instances where the metal is thin and where the various areas are fairly plain, a green sand mold will serve satisfactorily. However, a partial or complete drying is a recognized insurance feature employed by experienced foundrymen.

"Usual method of gating bust castings is through a considerable number of small passages distributed over the surface. Where the mold is to be dried gates are formed by lengths of cylindrical wax, which readily may be bent to converge at a central sprue extending through the top of the cope. A basin with a sprue hole and plug is set over the central sprue opening in the cope. The basin is filled with metal. The plug is withdrawn and the metal sinks into the mold by gravity.

"From the foregoing brief outline it is apparent that the production of one of these castings is a slow and expensive process. For best results a special sand is required. For many years sand from a deposit near Paris, France, and known as French sand was imported for the purpose. In recent years a satisfactory synthetic sand has been developed by a prominent sand supply house in this country.

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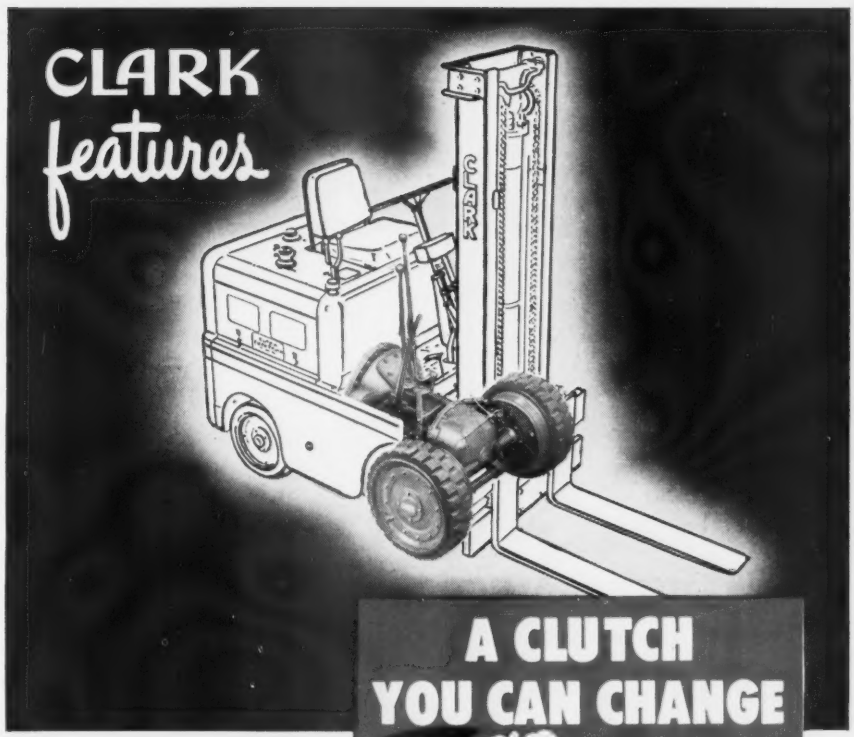
Magnesium-Treated Irons

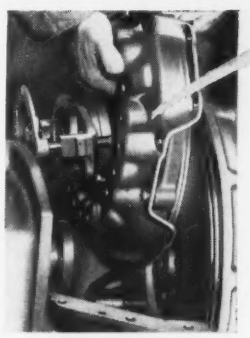
(*Continued from page* 86)

in the specimens slowly cooled in the mold to room temperature (Fig. 3, Heat B). The latter specimen exhibited the typical structure of irons containing insufficient magnesium, i.e., nodules and considerable quantities of quasi-flake graphite in a matrix of ferrite and pearlite.

The characteristics of graphite nucleation and of the decrease of carbide structures as a function of the eutectic solidification interval are presented in Fig. 4. It is apparent that the number of nodules, (spherulitic graphite with a predominantly spherical shape) remains essentially constant during the entire eutectic solidification time, whereas the total number of graphite particles (nodules plus quasi-flake) increases during the eutectic reaction. The count for zero time refers to the specimen quenched at a late stage of dendrite formation (Specimen 2, Fig. 2). The per cent of ledeburite present in the specimen decreases as the eutectic reaction proceeds but, as indicated in the micrographs, does not reach zero at the end of solidification. Approximately 5 per cent remains at the point determined (by inverse rate curve method) as the end of solidification.

Properly Treated Hypoeutectic Iron—The thermal and microstructural features of a hypoeutectic iron containing a proper magnesium content to produce wholly spherulitic structures (Heat C) are shown in Fig. 6. The specimen quenched following extensive formation of proeutectic austenite but prior to eutectic formation (Specimen 1) showed the presence of a limited number of small nodules embedded in a ledeburitic matrix. The specimen quenched soon after the start of eutectic reaction (Specimen 2) showed a greater number of nodules which were somewhat larger and surrounded by austenite rings. This specimen is considered of especial significance inasmuch as the majority of nodule sites were shown to be located adjacent to primary austenite dendrite





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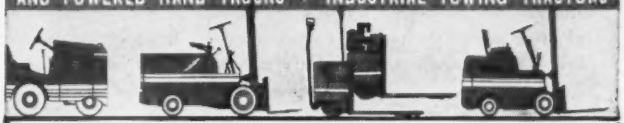

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arms. Thus, nucleation in supersaturated, near-dendrite liquid is indicated. The micrograph and microradiograph of this specimen (Fig. 6A) illustrate this feature in detail.

Specimens quenched at intermediate and late stages of eutectic reaction (Specimens 3 and 4) indicated the simultaneous growth of the spherulites and their austenite rings accompanied by a decrease in ledeburite. Specimen 4 contained many well developed nodules whose austenite rings had grown to the extent that impingement has resulted in nearly obliterating the dendrite pattern. Many ledeburitic areas existed as a semicontinuous network of patches. Specimen 5, quenched immediately after the end of solidification, possessed similar microconstituents with the exception of smaller and more widely spaced ledeburitic patches.

Specimen 6, quenched from a temperature slightly above 2000°F, contained identical microconstituents in similar distribution but with still smaller ledeburitic areas which were almost completely eliminated in Castings 7 and 8 (the latter not shown). The casting cooled to room temperature in the mold, Fig. 3, Heat C showed well-distributed nodules in a ferrite-pearlite matrix with traces of carbide structures. Graphite nucleation and carbide volume data for this heat are presented in Fig. 5. It is apparent that the nodule count remains essentially constant at a high value during the entire course of eutectic solidification. The nodule count for Specimen 1, which was quenched during dendrite formation (plotted at zero time), is considerably lower. The volume of ledeburite remaining after each successive quench decreases gradually as eutectic solidification progresses. Approximately 8 per cent remains at the end of solidification, however.

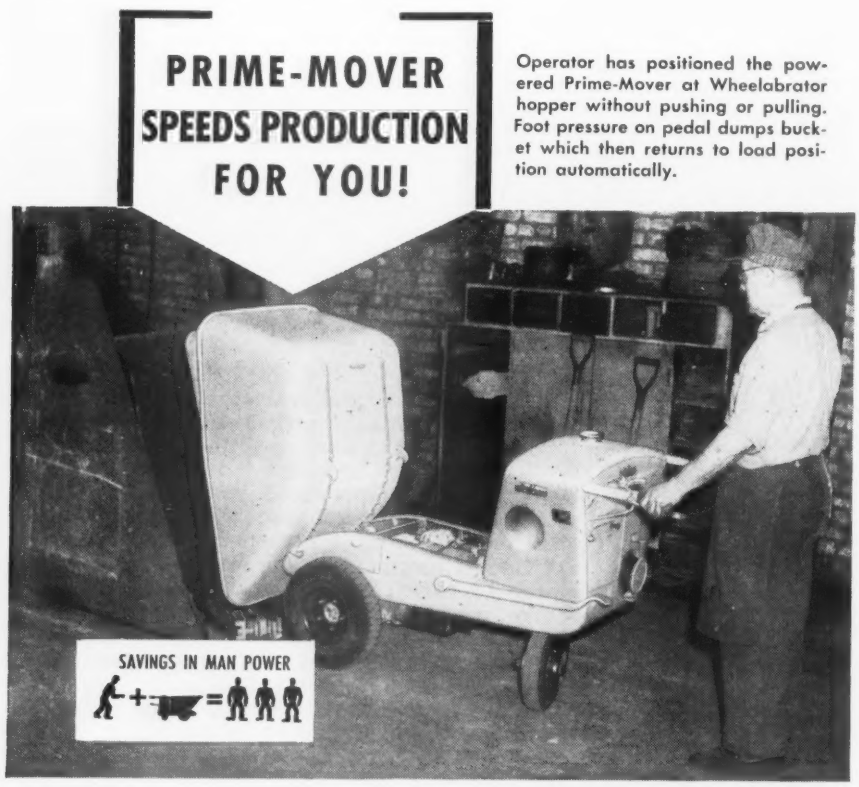
Properly Treated Hypereutectic Iron — The solidification characteristics for a properly treated hypereutectic iron (Heat N) are shown in Fig. 7. The cooling curve shows a primary arrest at 2110°F, believed to represent austenite formation, which was not expected in view of the chemical analysis. Examinations of Specimen 1 quenched immediately after this arrest showed dendrite arms* in addition to large and small graphite nodules surrounded by characteristic rings of austenite.

Specimen 2, quenched at a later time during the eutectic arrest, showed an increase in austenite ring sizes concomitant with a decrease in ledeburite volume. Specimen 3, quenched still later in the solidification process, illustrated further austenite ring growth. Ledeburite existed as relatively large areas in the specimen cross section. Specimen 4, quenched immediately after complete solidification, contained many large nodules with isolated pools (shown in micrograph) of ledeburite still present. In addition, isolated flake-like graphite located near the ledeburitic areas appeared in the microstructure. Isolated patches of flake graphite and traces of cementite were also observed in the casting mold-cooled to room temperature (Fig. 3).

The graphite nucleation and ledeburite volume data for Heat N are presented in Fig. 8. The nodule count for the specimen which was quenched immediately following the

(*Continued on page* 198)

* The coincidence of the two primary phases, hypereutectic graphite and dendrites of austenite, is not unusual in hypereutectic cast irons. The sequence of events is described by Morrogh (1) on the basis of an assumed supersolubility diagram in which undercooling occurs prior to eutectic solidification. During the undercooling period the dendrites of austenite form followed in turn by solidification of the eutectic complex. This sequence can logically explain the occurrence of the phases in this alloy.



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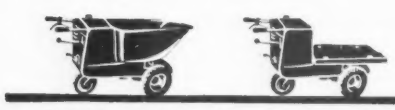

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(*Continued from page* 196)
short hypoeutectic arrest (Specimen 1) is considerably higher than counts for subsequent specimens quenched during the eutectic reaction. A slight increase of nodule number (which may possibly not be significant) is noted during the progression of eutectic formation. The presence of isolated patches of flake-like graphite was not included in the counts in keeping with the findings[8] that such structures may be ascribed to the segregation of minor trace elements. The volume of ledeburite remaining at the end of solidification is approximately 5 per cent.

Discussion—The genesis of nodules in the liquid of hypereutectic cerium- and magnesium-treated melts appears to be generally accepted. Experiments such as centrifuging of the liquid metal, provide direct evidence of this fact. For hypoeutectic magnesium melts the genesis of nodules has remained a subject of conjecture. The evidence in this case must be less direct and more dependent on the observers' interpretations. The approach taken in this investigation, which is based on quenching partly solidified melts, requires consideration of the possible contribution of the quench to nodule formation.

Perhaps the most significant fact to be noted from the nodule counts is the early formation times and the apparent lack of significant increase in number during eutectic reaction. There are two possible immediate interpretations which may be made from these observations:

1. All nodules are formed "by" or "at the time of" the first stages of eutectic reaction—no new nodules form thereafter.

2. A preponderance of nodules form as outlined above—a comparatively smaller number form during eutectic reaction at a rate which decreases as the amount of remaining liquid decreases. On this supposition the true curve of nodule formation during the eutectic interval should slope to greater numbers with increasing time.

Nodule Counts Are Low

These two interpretations differ only in regards to the possibility of formation of a small number of nodules during eutectic reaction. In this respect it is noted that in the case of the hypoeutectic irons the nodule counts for the specimens quenched prior to eutectic reaction (Heats B and C) are relatively low. The amounts in question are not greatly in excess of the scatter noted in subsequent counts. Thus, if it is assumed that these nodules are quench-formed, the contribution of the quench must be considered to be relatively minor. The shape of the nodule count curves, which indicate that new nodules are not formed, should therefore be considered accurate within limits of experimental errors in the counting process.

These observations indicate that nodule formation in hypoeutectic irons is associated with the transition stage marked by the ending of austenite reaction and the start of the eutectic reaction. At this time the nominal compostion of the liquid is eutectic with possible localized interdendritic pools of hypereutectic liquid resulting either from incipient divorcement of the liquid or from supersaturation due to the undercooling effect of magnesium. (The indications of undercooling in the thermal curves at the stage of initial eutectic reaction are significant in this respect). Such pools behave as hypereutectic melts, providing conditions for the genesis of nodules from liquid in the normal fashion of hypereutectic melts. Since these specific conditions of supersaturation near austenite dendrites do not exist

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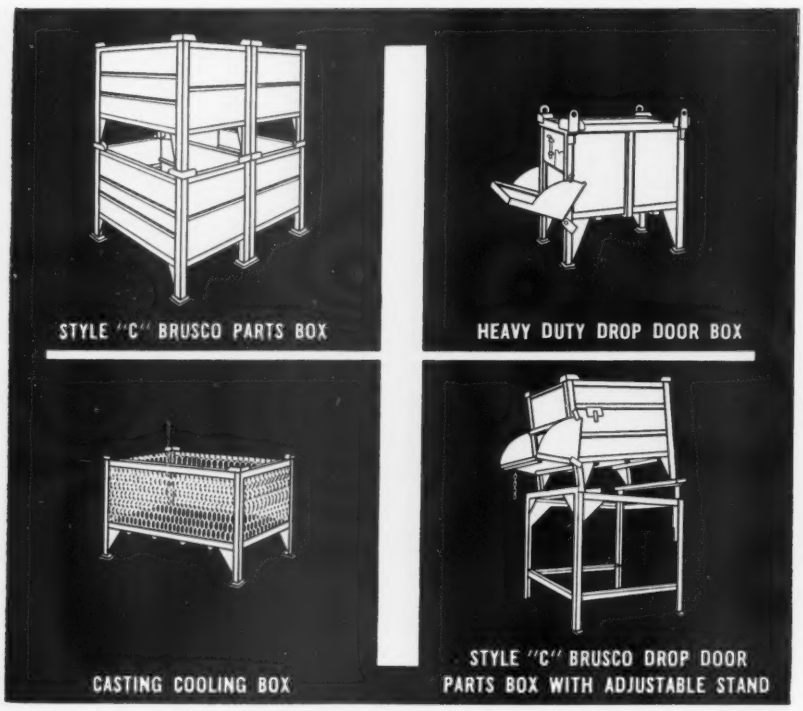
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after eutectic reaction has progressed new nodules are not developed during eutectic reaction.

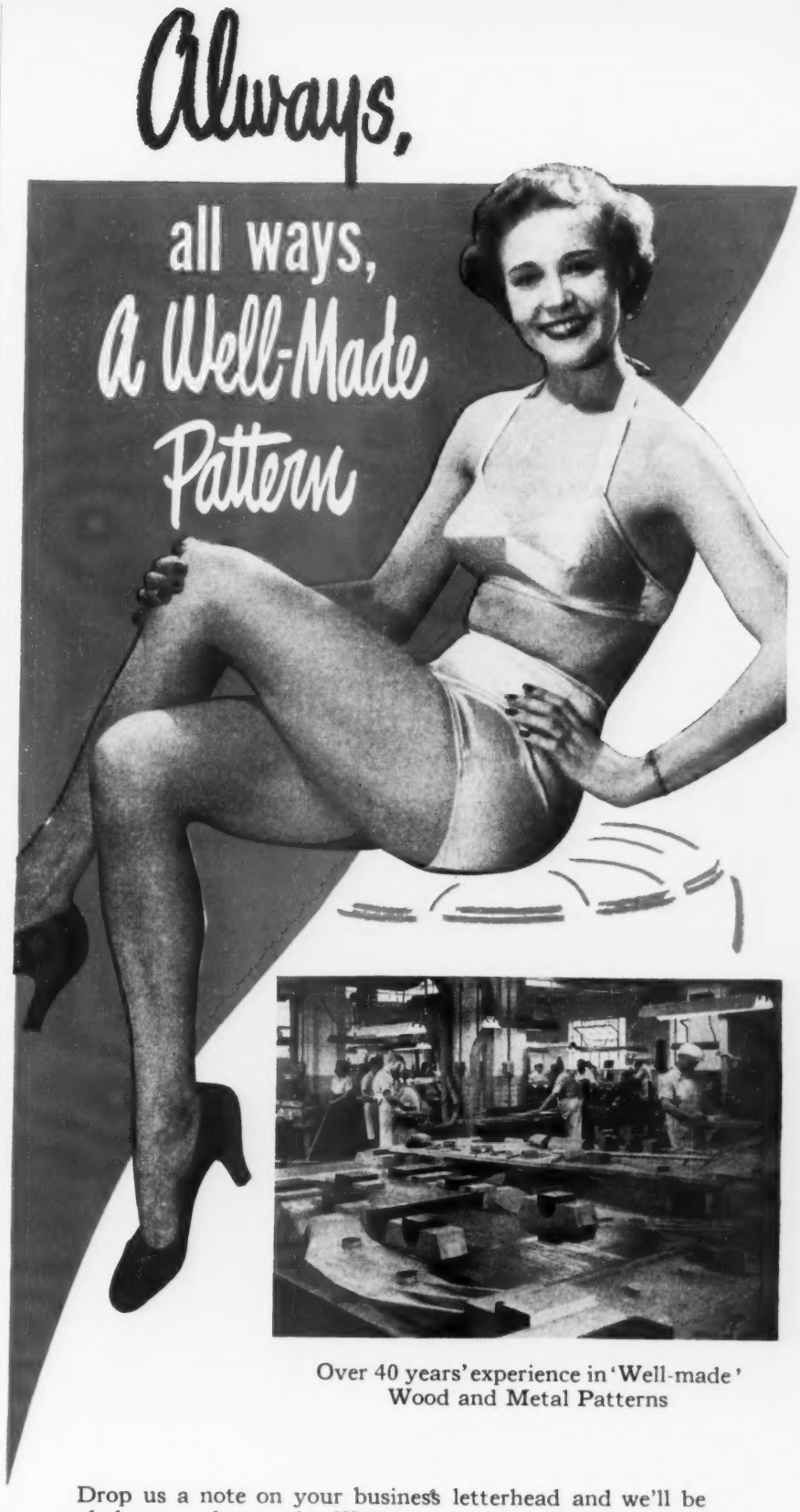
The hypereutectic iron nodule count curve possibly presents a special case of quench-contributed nodules with the apparently anomalous indication of high nodule counts at the start of eutectic reaction and much smaller counts at later times. This anomaly is tentatively explained on the hypothesis that quenching at the time the eutectic reaction is about to start results in an exaggeration of the supersaturation condition, with the consequent development of many small austenite dendrites which provide nucleation sites in a fashion shown for the hypoeutectic melts. The number of nodules is accordingly increased to a high number not typical of normally-cooled hypereutectic melts.

The small initial number of quasi-flake particles and the continually increasing number shown during eutectic reaction indicates that the genesis of these structures occurs during eutectic reaction. The nucleation pattern follows that deduced to be general for flake structures[9].

No Conclusive Evidence

The lack of eutectic stage nodule nucleation and the feature of growth of nodules surrounded by austenite rings suggests a process of eutectic reaction to ledeburite followed by almost immediate malleableization such as described by Morrogh for hypereutectic cerium melts. Exacting examination of the specimens failed to yield a positive indication of metastable eutectic solidification (as an austenite-iron carbide complex) because of the difficulty in differentiating with assurance between ledeburite which solidified prior to and during the quench operation when striated ledeburite is the general structure. Carbide particle size differences in some cases indicated that this mechanism was operative but no conclusive evidence could be extracted from such examinations.

The inherent difficulty of determining with precision by use of thermal analysis the very last traces of liquid metal remaining in the casting has prevented a positive conclusion that solidification to carbide structures followed by malleableization is in fact occurring. However, based on the author's experience with solidification studies[10, 11] it is believed that the solidification of amounts of liquid from 5 to 10 per cent will be detected thermally. Added evidence for malleableization may be found in the observed decrease in the small amounts of undecomposed ledeburite



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at temperatures considerably below eutectic temperature.

These observations, coupled with the inability to rationalize a concept of austenite-graphite eutectic formation invloving no intimate contact between the graphite and liquid phases, indicate validity for the conclusion that austenite-carbide eutectic is formed as a prior structure.

The continuous nucleation features of quasi-flake graphite suggests a mechanism wnerein the nuclei for such graphite are formed either by the decomposition of solidified carbides or directly from the eutectic liquid.

Conclusions—It is tentatively concluded that the sequence of events occurring during the solidification of hypoeutectic cast iron properly treated with magnesium can be outlined as follows:

Stage 1: The solidification of dendrites of austenite beginning at the liquidus temperature and continuing to the temperature at which the normal eutectic consisting of flake graphite and austenite would occur.

Stage 2: Suppression of the normal flake graphite eutectic during which interval graphite precipitates from localized regions of supersaturated interdendritic liquid in a spherulitic crystallization mode.

Stage 3: Solidification of the remaining eutectic liquid as an austenite iron carbide complex and rapid malleableization of the structure resulting in growth of the graphite particles.

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NODULE FORMATION DISCUSSED AT INTERNATIONAL CONGRESS

By VINCENT DELPORT
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DISCUSSIONS following presentation of papers on nodular irons at the 1951 International Foundry Congress in Brussels, Belgium, centered largely on explanation of the mechanism of formation of spheroidal graphite. This followed the papers by Dr. A. Wittmoser, of Germany, and by R. P. Dunphy and W. S. Pellini, Naval Research Laboratory, Washington. Prof. A. de Sy, University of Gent, and director of the Belgian Research Center on Cast Iron, one of the leading continental experts on nodular cast iron, presided at the session.

In opening the discussion, Professor de Sy summarized the position as follows:

Dr. Wittmoser takes up the hypothesis of the formation of the spherulites through precipitation in supersaturated austenite. In two papers previously published by himself(Prof. de Sy) in the *Revue Universelle des Mines* (August 1950)and in *Metal Progress* (June 1951), this possibility had been considered, with the qualification that absolute evidence of this theory was lacking. Professor de Sy then put forward three ideas, two being stated in the two papers, the third resulting from investigations made at the Research Center at Gent:

1. Dr. Wittmoser shows the predominance of solidification in the form of mixed crystals brought out by globular segregation, and he shows also that the nodules are always found in the center of the mixed crystals.

2. The results of the "nodule count" advanced by Pellini and Dunphy clearly prove that, in the case of genuine nodular cast iron, *all* the nodules are formed during a very short time corresponding to the beginning of the horizontal part of the cooling curve, i.e. immediately before the solidification which, according to Pellini's theory, should be considered as the eutectic: austenite + carbides.

3. In the pipe cavity of a cylindrical bar of nodular cast iron having a diameter of 50 mm., the Gent investigators found outstanding macroscopic dendrites. This seems to indicate that, even at the end of solidification, some primary crystals were formed; in accordance with the morphologic study of eutectics by Guillet and Portevin, these primary crystals can give rise to:

a—"Colonies" of eutectics.

b—Regular crystals of one of the constituents.

c—Even dendrites of one of the constituents, but never dendrites of the actual eutectic.

Even if the iron were hypoeutectic, the last stages of solidification should be in the form of an eutectic. But the iron from which the bar was cast was truly hypereutectic and of the following composition: C 3.74, P 0.07, Mn 0.80, Mg 0.045, Si 2.14, Cu 0.82, S 0.01, the carbon equivalent being about 4.5.

From these new facts and from previous knowledge, it is to be hoped, said Professor de Sy, that a further step will be made toward the understanding of the mechanism of formation of graphite nodules.

In the discussion that followed, Dr. Ballay, France, said that, while Dr. Wittmoser's explanation of the formation of spherulites might apply to hypoeutectic irons, it did not explain the case for hypereutectic irons. On the other hand, the reference in Dr. Wittmoser's paper to certain regions which were strongly attacked by certain reagents was of interest, and there might be a relation between the segregations shown up by the attack and the properties of the iron, although this may have no bearing on the solidification of the graphite. Mr. Pellini asked how Dr. Wittmoser explained, according to his hypothesis, the presence of numerous small nodules not surrounded by austenite rings, as were shown in his (Mr. Pellini's) paper.

Dr. Wittmoser offered further explanations on these and other points, but no agreed solution was found to the problem under discussion.

Professor de Sy, with a view to stimulating further discussion, and in the hope of advancing toward a better understanding of the mechanism of formation of spherulites, submitted the three following hypotheses as a basis for discussion, the

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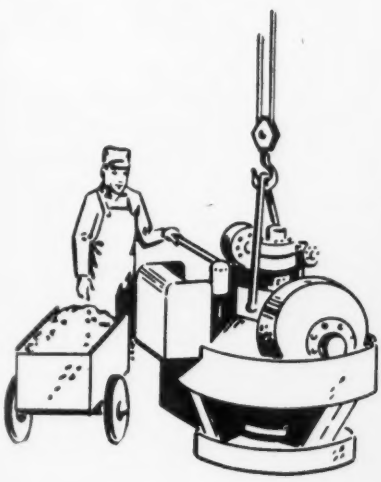

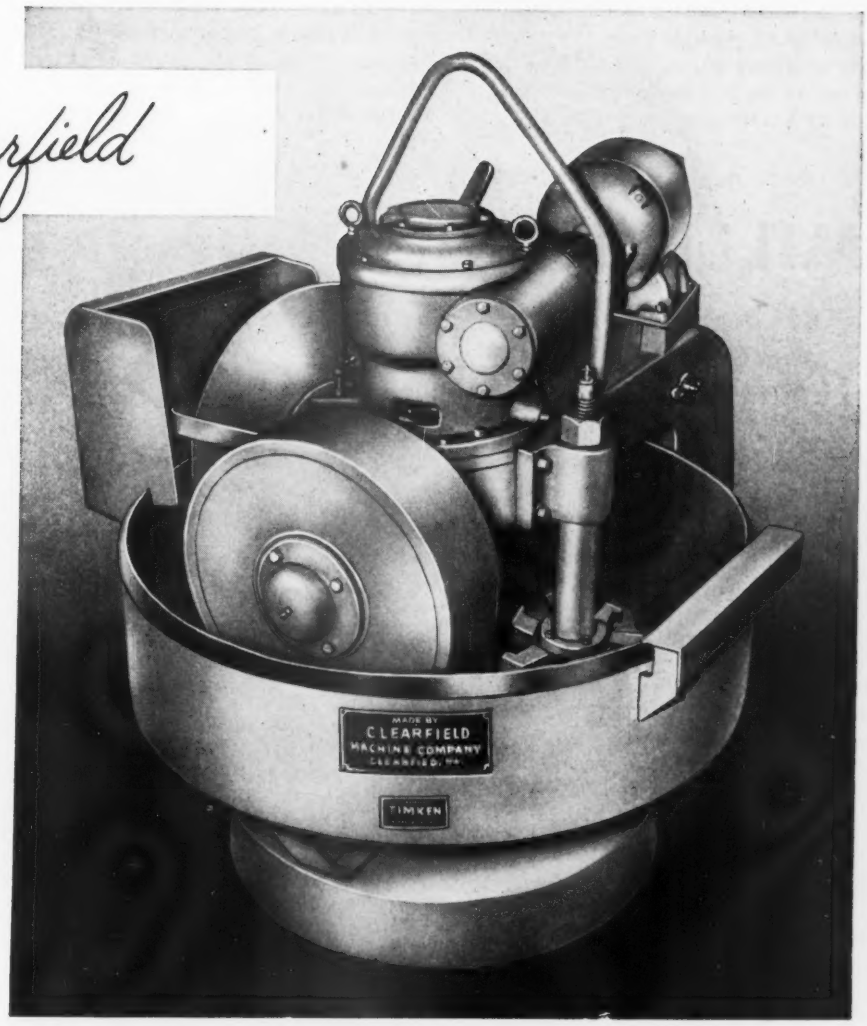

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(*Continued from page* 200)
second being based on Pellini and Dunphy's paper, and the third on Wittmoser's contribution:—

a. The nodule makes its appearance in the solid state by decomposition of the ledeburitic cementite. This hypothesis should not be rejected a priori, for the annealing of a magnesium-treated iron which has solidified as white iron gives spherulites, and what is possible in a few hours' time at about 900 to 950° C, does not appear to be impossible in a few seconds at a temperature which is very close to the temperature of solidification.

b. The nodule appears in the liquid by precipitation of carbon from hypereutectic elements (interdendritic in the case of hypoeutectic irons); this primary precipitation causes the remaining liquid to be composed of ledeburitic eutectic, and it is in fact followed by solidification in the form of ledeburite; by very rapid automalleabilization the cementite is decomposed into austenite, and carbon migrating toward existing nodules. In brief, nodules appear in the liquid and grow rapidly in the solid by decomposition of the cementite.

c. Precipitation and growth in the supersaturated austenite; this hypothesis implies complete solidification as mixed crystals and, therefore, a displacement toward the right of the eutectic point; in other words, nodular cast iron gives no eutectic and it always solidifies as mixed crystals.

The value of each of these hypotheses must be measured by submitting them to the test of known facts, particularly in connection with nodular iron. The hypotheses must enable certain specific peculiarities of nodular irons to be explained, such as: Piping flotation of nodules in certain known cases; superfusion; the dendrites found at the end of solidification in hypereutectic nodular iron; the "nodule count" of Pellini-Dunphy; the segregation and position of nodules; the shape of cooling curves; the compact graphite in an imperfectly treated iron; the spherulitic form of graphite, etc.

Subject Is Debatable

It is to be noted, said Professor de Sy, that any hypothesis that stands to the critical test referred to above must explain the formation of nodules, not only by magnesium, but also by other elements.

No time was available for further discussion, but the question was further debated at Professor de Sy's laboratory with Pellini, Wittmoser, Vidts and Collette. The hypotheses (b) and (c) were examined in conjunction with known facts, which could be explained more or less easily by either theory, so that both should be investigated further with a view to eliminating one in favor of the other; Professor de Sy, Dr. Wittmoser and Mr. Pellini agreed to undertake a series of experiments in their respective laboratories and to exchange the results of their experiments.

Following the paper by Professor de Sy, R. Collette and J. Vidts, on "As-Cast Structure of Ca-Mg Treated Nodular Cast Iron With and Without Secondary Inoculation," R. Chavy, France, asked if the calcium had been measured. Professor de Sy replied that they had tried but were not satisfied with the results. Methods of measuring calcium were being seriously investigated in two well equipped foreign laboratories, and it was thought that the correct policy for the Gent laboratory was to concentrate on more urgent work. They had reason to believe, however, that the calcium content in the iron treated by the Ca-Mg method was approxi-

(*Continued on page* 204)

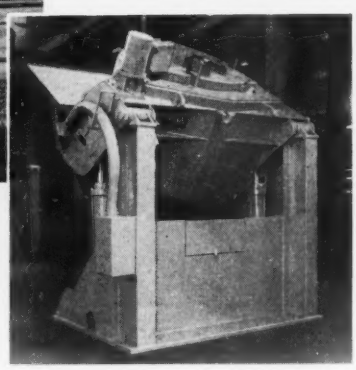
MILLIONS OF POUNDS

of Aluminum per year reclaimed with the help of

AJAX INDUCTION FURNACES

166 kW AJAX Induction Furnace in tilted position, pouring molten aluminum alloy through a coated trough into ingot molds on conveyor.

Major Auto Manufacturer recovers scrap from machining operation by modern melting process



Above is a 330 kW furnace. AJAX Engineering Corporation manufactures low frequency electric induction furnaces in a great variety of sizes ranging from 20 to 1000 kW. This type of equipment has been adapted to the full range of nonferrous metals and alloys.

Here is an interesting setup for reclaiming aluminum alloy chips, which is installed adjacent to the piston casting setup in one of the largest automobile manufacturing plants in the country. More than half of the aluminum needed for pistons in this plant comes from this scrap recovery program. A considerable net profit is realized, and aluminum purchases are lowered.

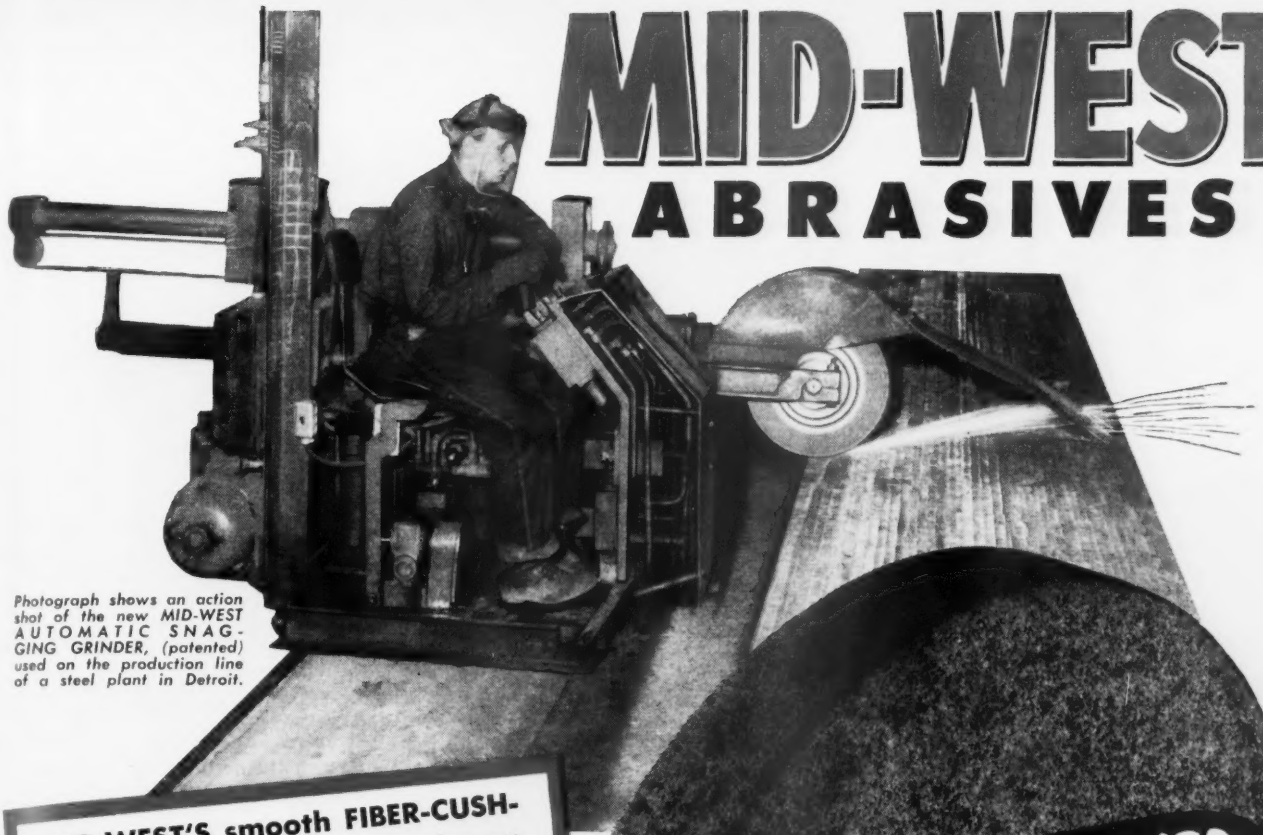
Send for Reprint of Article on Scrap Recovery by Induction Furnaces

AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Halligan Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

MID-WEST ABRASIVES



Photograph shows an action shot of the new MID-WEST AUTOMATIC SNAGGING GRINDER, (patented) used on the production line of a steel plant in Detroit.

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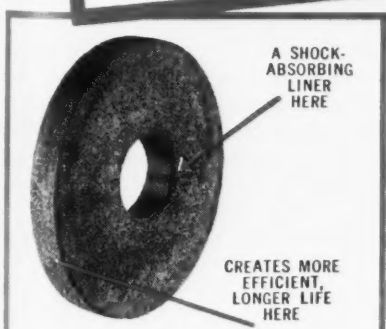
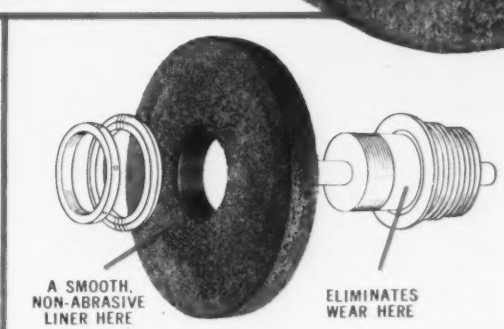
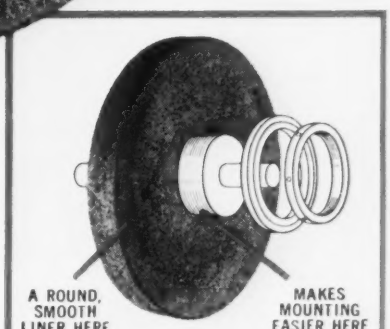




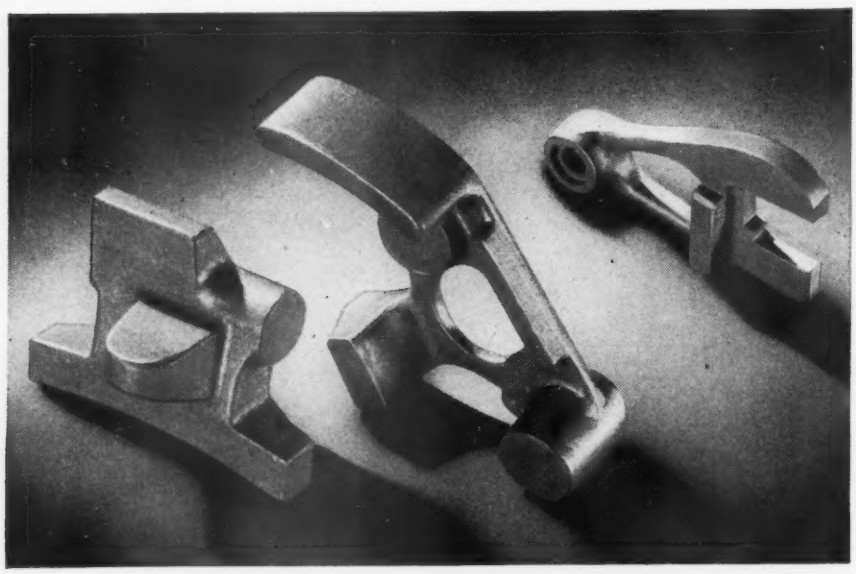


(*Continued from page* 202)

mately 0.015 per cent. Mr. Collette added that the spectrographic analysis of the magnesium showed characteristic calcium lines in the spectrum, but no quantitative results could be obtained as long as standards relative to samples of known Ca content are not available.

Mr. Chavy asked if the diameters of the test pieces used, i.e., 1", ½" and ¼", were not too small in regard to the sizes of industrial castings. Mr. Collette answered that if larger test pieces had been used they would only have shown an increase in the amount of ferrite. What they were aiming at was to study the relation between the effects of silicon, remaining carbides and secondary inoculation.

Dr. Mortara, Italy, pointed out that some carbides did remain in the small test pieces and asked why the author suppressed the action of silicon. Professor de Sy replied that, for the same final analysis, they obtained, without secondary inoculation, (1) mechanical properties at least equal to those obtained with the secondary treatment, and (2) no greater amount of free carbide. Therefore, the secondary inoculation, which in any case, has its drawbacks, could be avoided. If certain sections of ½" and ¼", with low silicon content, still show the presence of carbides, this would happen in both cases. It is obvious that, for a given treatment, one is bound to obtain free carbides when the thickness and the silicon content are reduced. The paper indicates that free carbides appear only in the smaller sections of ½" and ¼" and for a silicon content 2 per cent. In any case, even with a final silicon content of only 1.5 per cent, the use of the Ca-Mg process with limitation of residual Mg, enables a gray nodular iron to be obtained without secondary inoculation, i.e. a nodular gray iron without free carbides for sections 1" diameter. The same applies to smaller diameters, provided the silicon is controlled in relation to the pouring section.



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Ductile Iron Ingot Molds

After A. P. Gagnebin presented his paper on "Ductile Iron," Professor de Sy asked if the author had any experience with ingot molds made of ductile iron. Mr. Gagnebin replied that some experiments had been made with molds weighing up to 5 tons and results, although incomplete, showed that ductile iron would be very useful for the purpose. Tests were being made on a series of 30 ingot molds of 5 tons, and results were expected in six months. The castings were not heat treated, the operation being too costly and often impossible. Answering another question, Mr. Gagnebin said there were about 35 basic cupolas in the United States. The largest, 72 in. in diameter, produced 20 tons per hour 24 hours a day.

J. H. Rheder, Canada, pointed out that the data given by the author relating tensile strength and ductility to brinell hardness, agreed entirely with the result of his own work, which was carried out quite independently; this would indicate that the brinell hardness test gives a useful indication of the strength of as-cast nodular iron. These data, however, cannot be applied directly to quenched and tempered nodular irons.

Mr. Hughes, Great Britan, expressed some doubts whether ductile iron could be substituted for malleable iron and steel, before the new alloy had been adequately tested in service over a period of time. He also raised, among other points, the question of costs—not only capital cost, but also cost of operation. The author, in reply, cited cases where ductile iron had been used satisfactorily in every way in the production of castings.

From replies given to questions following the paper on "Quantity Production of Spheroidal Cast Iron," by N. Croft, Great Britain, the following additional information was given: For the rapid empirical test to determine, before pouring the castings, whether the iron had been satisfactorily treated, a small sample ½ x ½ in., had been poured; after approximately 2 minutes, this small bar was broken and examination of the fracture showed whether or not the treatment was satisfactory. The pig irons used by the author came from diverse sources and 20 per cent steel was included in the charge, the charge being melted in a cupola. Asked whether relations had been established between the results obtained with the test bars and the mechanical properties of the castings, the author replied in the negative, except for brinell hardness. The following properties were guaranteed: As-cast: 40 T/sq in. and 0-8% elongation; annealed: 25 T/sq in. and 8-20% elongation. The initial sulphur averaged 0.08 per cent.

Commenting on Dr. Ballay's paper on "Properties of Self-Hardening Spheroidal Graphite Alloy Cast Iron," Professor de Sy said that in tests made on Ni-resist nodular iron, in his laboratory, tensile strengths of 30 and 35 kg per sq mm had been obtained, but the test bar had been machined from a 1-in. bar. Mr. Chavy said that for similar irons he had obtained 40 to 42 kg, but the test pieces had been machined from a keel block, which gives sounder test pieces. He also mentioned results of treatment on nodular iron camshafts with nickel-molybdenum and 0.2 to 1 per cent Mn. The brinell hardness was 340 as-cast, and reached 480 to 500 after heat treatment. Mr. Guenzi, France, expressed doubts about the relative value of the brinell hardness for nodular and flaked graphite irons. He expressed the opinion that the very form of the graphite could influence the test for two irons of the same composition, and it was, therefore,difficult to compare the brinell hardness in these cases.

Book Describes Battelle

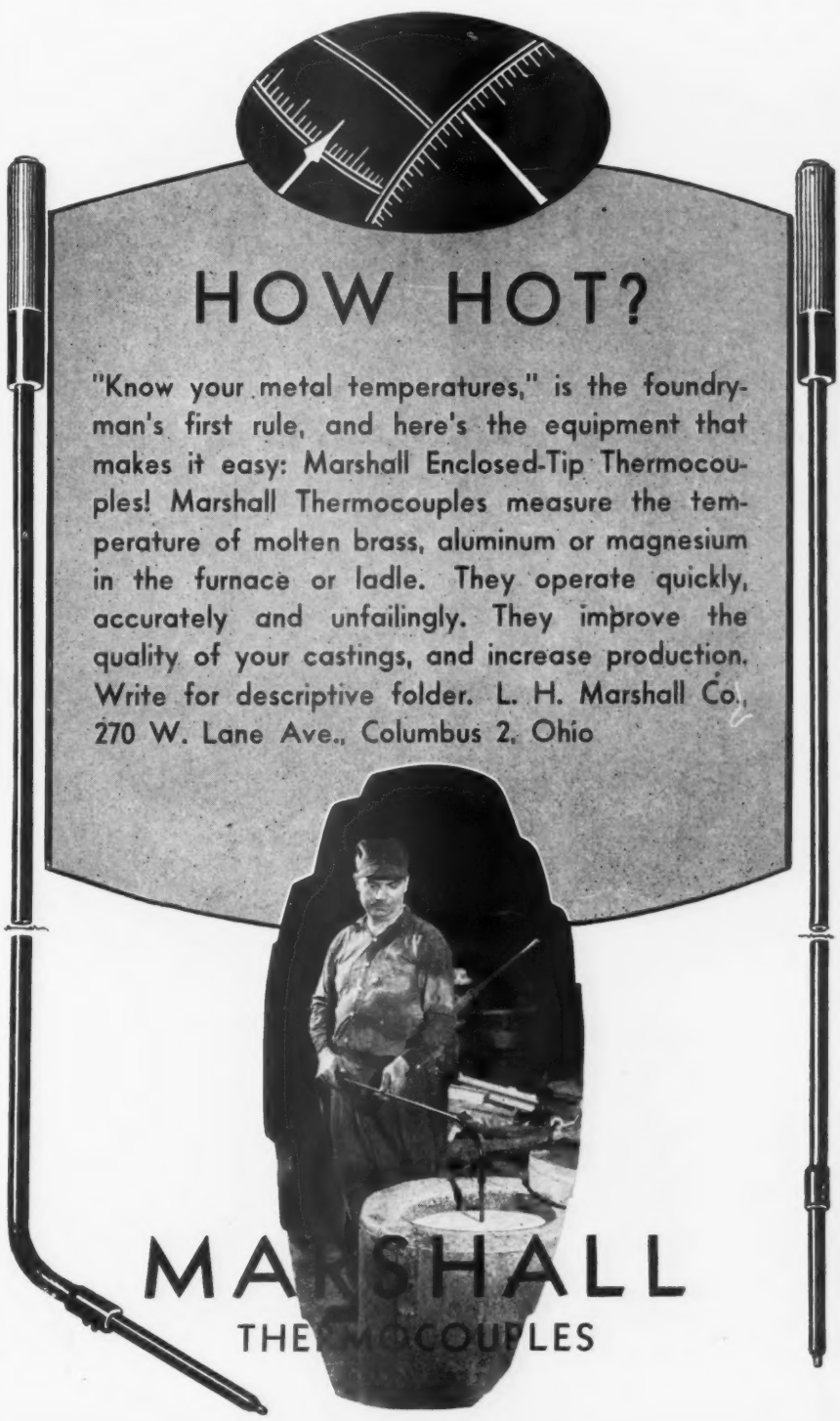
Battelle Memorial Institute, Columbus 1, O., has published an illustrated booklet presenting the people who supervise and conduct its research work and showing and describing its facilities for conducting research and pilot plant operations. It outlines the fields in which Battelle is equipped to conduct research and contains a partial list of companies that have sponsored programs at the institute.

Book Review

Phase Transformations in Solids, sponsored by the committee on solids, division of physical sciences, National Research Council, cloth, 660 pages, 5½ x 8½ in., published by John Wiley & Sons Inc., New York. Price $9.50.

Various papers presented at a conference on Phase Transformations in Solids, Cornell University, are presented in this volume along with discussions on the papers. The conference brought together scientists from the fields of physics, chemistry, crystallography, ceramics and glass who had a common interest in the fundamental phenomenon of phase change.

Material in the book is of three types. First six chapters deal with theoretical material; chapters 7-12 with nonmetals, and chapters 13-17 with metals. Of particular interest to foundrymen are papers in the last section. These are: Transformations in Pure Metals, Order-Disorder Transitions in Metal Alloy, Precipitation from Solid Solutions of Metals, Eutectoid Reaction, and Martensite Transformation.

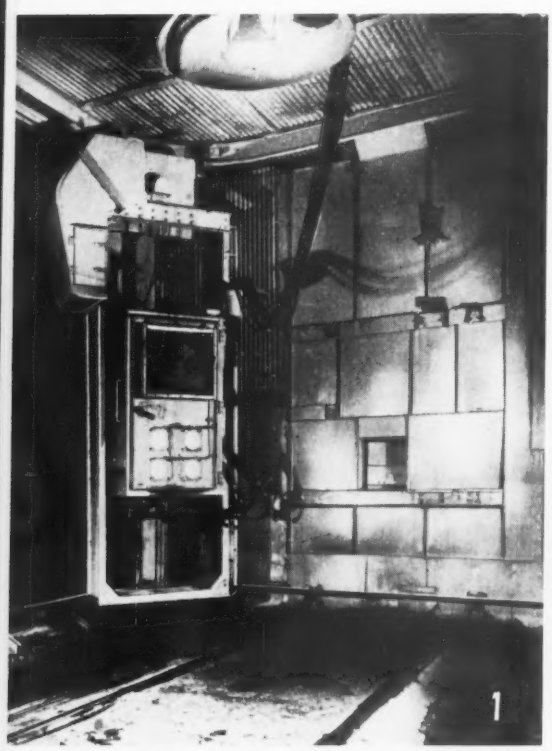

HOW HOT?
"Know your metal temperatures," is the foundryman's first rule, and here's the equipment that makes it easy: Marshall Enclosed-Tip Thermocouples! Marshall Thermocouples measure the temperature of molten brass, aluminum or magnesium in the furnace or ladle. They operate quickly, accurately and unfailingly. They improve the quality of your castings, and increase production. Write for descriptive folder. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio
MARSHALL
THERMOCOUPLES

New EQUIPMENT *and Supplies*

For Additional Information on these Items Use Reply Card—Page 209

(1)—Cleaning Room: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Hydro-Sand Blast room features an air-conditioned cab in which the operator directs an abrasive stream against the casting being cleaned. Cab is mounted on a carrier which moves along three sides of the cleaning room on a monorail. The car also moves vertically to give the cleaning gun complete coverage of the work. Gun nozzle has a capacity of 60 gpm at 2000 psi. Turret-like action of the gun allows rotation through 60 degrees horizontally and 50 degrees vertically. By moving the carrier along the wall, the cab up and down, and rotating the gun, the operator can direct the abrasive stream from an infinite number of points to cover all the surfaces and crevices of intricate castings. The cleaning room illustrated is 23 ft, 6 in. long, 21 ft wide, and 17 ft high. Castings are placed on a work car and pushed into the center of the room. Spent sand and water fall to the floor and drain off through a bar grate to a reclamation unit. The room was designed by engineers of Pangborn and Falk Corp., Milwaukee, to meet particular requirements of the Falk foundry where it is installed. Castings weighing 90,000 lb have been cleaned in the room.

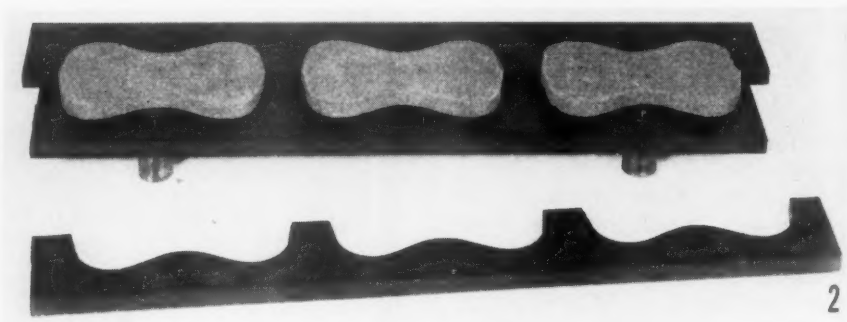
For More Details Circle No. 1—Page 209



1

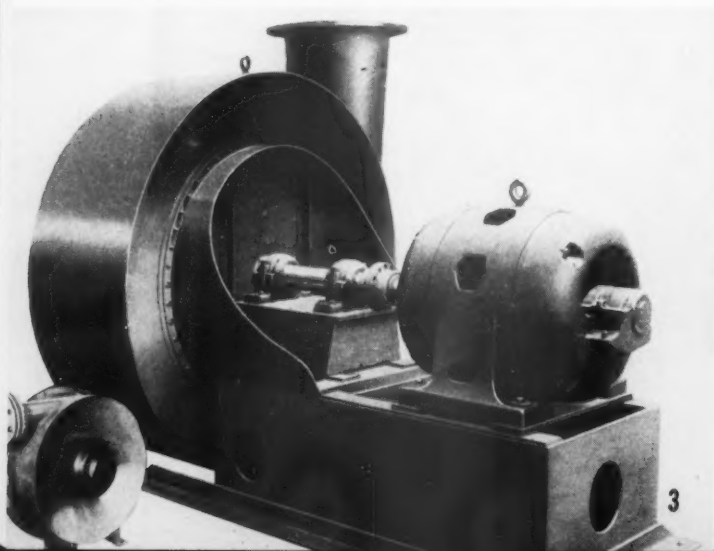
(2)—Shell Mold Tester: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Shell molding tensile accessory is designed to produce cores for measuring variables of sand, binder, binder ratio and curing cycle to facilitate proper control of mold shell strength. The accessory consists of a corebox for making three ¼-in.-thick cores and may be placed in the laboratory core oven for curing. Cores are tested in a sand strength machine with a core tensile accessory.

For More Details Circle No. 2—Page 209



2

(3)—Blowers: Billmyre Blower Division, Lamson Corp., 425 Lamson Ave., Syracuse 1, N. Y.—Standard models of a new line of fabricated



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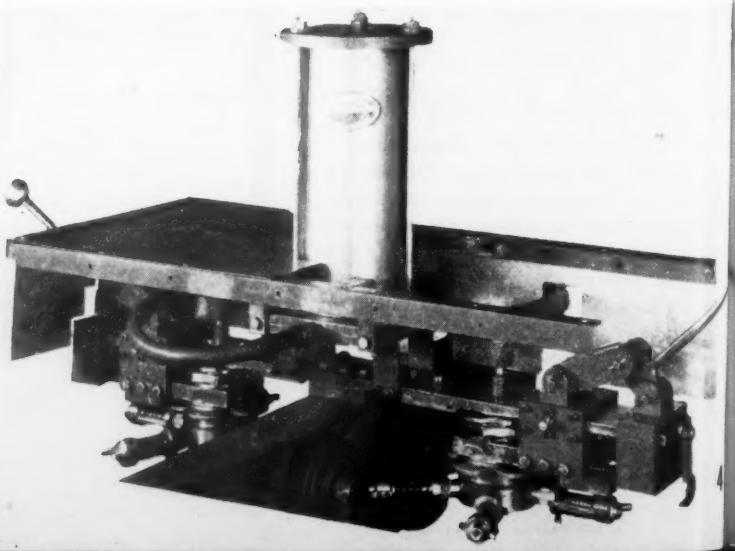


steel blowers range in capacity up to 200 hp. Three styles are offered: A multistage and a single stage model operating at 3500 rpm, and one operating at 1750 rpm. Standard outlet pipe sizes run from 4 in. to 24 in., all flange fitted. Designed on a standard basis for air only, they can be adapted to use of corrosive, poisonous or explosive gases on special orders calling for stainless or sparkproof materials and special gasketing. Blower outlets may be oriented in any of 14 positions depending upon the desired discharge angle and offset (from shaft center line). Delivered air pressures up to 3 psi (5.3 in. mercury) may be had. Constant pressure is maintained irrespective of air volume, but power consumption is directly proportional to air volume.

For More Details Circle No. 3—Page 209

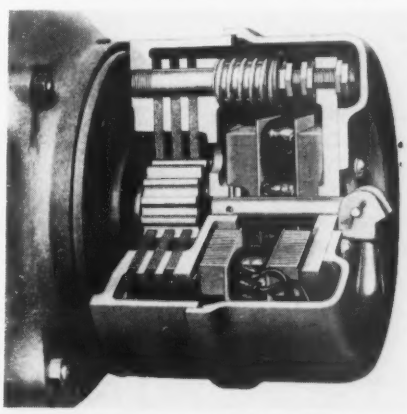
(4)—Conveyor Lubricator: J. N. Fauver Co., 49 West Hancock, Detroit 1—Automatic, enclosed conveyor lubricator is a self-contained grease lubricator type driven by contact with the trolley wheels. As the trolley wheel approaches lubricator, hub engages sleeve of one of the five pumping units. Continued rotation of the lubricator forces the pumping unit inward, delivering a measured quantity of lubricant to the wheel bearing. Then a cam located in the pump housing snaps the next pumping unit into position to contact the next wheel. Unit operates on conveyor wheels equipped with or without Zerk hydraulic fittings.

For More Details Circle No. 4—Page 209

Remote Control: Baker Industrial Truck Division, Baker-Raulang Co., 1250 West 80th St., Cleveland 2—Remote control attachment for fork trucks allows truck operators to control the lifting and lowering action of the forks at a distance from the truck's control panel. It was developed to enable a fork truck to get at infrequently used stock stored in hard-to-reach bins. During normal truck operation the remote control unit clamps over the tie bar on the truck's inner upright. Cable for the remote control unit is housed in reels, under tension, so that it won't kink. Reels contain enough cable to allow unit to reach truck's standard lift limit. All company fork truck models can be outfitted with the new attachment.

For More Details Circle No. 5—Page 209

Magnetic Brakes: Dings Brakes Inc., 4740 West Electric Ave., Milwaukee 46: Alternating or direct current direct acting disk type magnetic brakes are designed to stop any motor instantly, to hold the load, and to release with no drag. Brake is spring engaged and magnetically released and is designed to mount on NEMA type C motor flanges. Friction disks, springs, and magnet constitute the heart of the unit. High thermal ratings are claimed for the brake. A manual release lever, located outside the housing enables operator to disengage brake. This mechanism automatically resets itself, restoring unit to usual operating condition when power is applied.



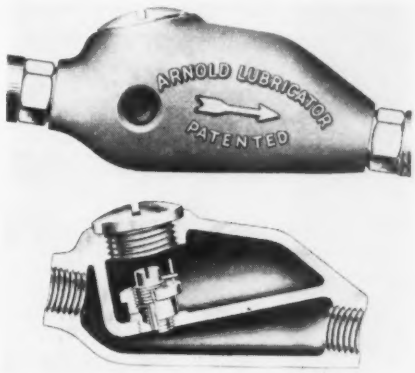
Brakes are enclosed, drip-proof weather-proof and operate on 220 or 440-v motors.

For More Details Circle No. 6—Page 209

Abrasive Blade: Clipper Mfg. Co., 2800 Warwick, Kansas City 8, Mo.—Abrasive, masonry cutting blade is designed to be break resistant. It is said to be undamaged by dropping, twisting in the cut, or bending. It is manufactured in layers of glass fiber cloth impregnated with resins and silicon carbide. This material is then pressed together under hydraulic pressure and processed in kilns where the temperature is controlled to insure a resilient and tough blade. Blade is particularly adapted to small hand power tools where it is almost impossible to maintain a true cutting level. Its most effective performance is in the softer range of materials such as limestone, sandstone, light aggregate concrete products and dry press refractories. For harder materials, the company's metal-bonded diamond blades are recommended.

For More Details Circle No. 7—Page 209

Lubricator: Rucker Co., 4228 Hollis St., Oakland, Calif.—Pneumatic tool lubricator with ½-pint oil capacity, when placed in an air line,



supplies a flow of oiled air to the working parts of the tool. Adjustable feeder enables operator to adjust oil flow to the needs of the job. Oil may be added under line pressure; a new pressure-proof window shows at all times how much oil is in the lubricator. It is 7 in. long, 3½-in. wide and high and weighs 32 oz. Other sizes range from 4½ to 10 in. in overall length and from 1/6 to 1 pint capacity.

For More Details Circle No. 8—Page 209

Hose Reel: Wayne Pump Co., Fort Wayne 4, Ind.—Hose reel may be used with water, fluid lubricants, coolants or air. Reel is attached to the end of a lathe or other machine requiring application of a coolant. The fluid is fed into the reel and through the hose to the cutting tool head. Hose moves automatically, following the tool with cooling liquid. It may be used as a bench reel or mounted overhead to supply portable air tools. It provides tool suspension as well as air supply in one unit, keeping tools off the bench but in convenient reach.

For More Details Circle No. 9—Page 209

Impregnant: Kirk White Chemical Co., 121 West Second St., Oconomowoc, Wis.—Compound for impregnating castings is a clear solution which penetrates into and through pores and pore channels at a constant consistency. It is said to harden without heat to form barriers in pores and pore channels which pack tight. Additional claims are that it does not oxidize or polymerize with consequent deterioration; is odorless, tasteless, and nontoxic in its hardened state; does not support com-

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bustion, mold or mildew growth; is insoluble in acids, alkalies, alcohols, aliphatic hydrocarbons, gasoline or salt water, and cannot be dissolved from pores of the casting by its own solvent. It hardens by release or evaporation of its solvent and will not spoil in the system or in storage, it is claimed. It is designed for use with the vacuum (batch) system and the internal pressure system of casting impregnation.

For More Details Circle No. 10—Page 209

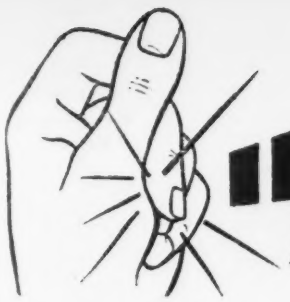
Hoist-Binder: Coffing Hoist Co., 800 Walter St., Danville, Ill.—Load binder works on the ratchet hoist principle, and will take up or slack off a load chain any amount up to 20½-in. without the necessity of releasing the entire load to take a new

grab. Binding and slacking off is done by the handle only, with no buttons or levers to push, no locking device to release. The handle will not fly up under load. Also it may be removed to prevent tampering with either the load or the binder. As a safety feature, the handle bends before the binder can be overloaded beyond safe limits. Unit weighs 10 lb and will exert a pull of 3000 lb, it is claimed.

For More Details Circle No. 11—Page 209

Motor System: Baldor Electric Co., 4353 Duncan Ave., St. Louis 10—Adjustable-speed motor system for operation from polyphase or single phase alternating current circuits consist of three units: A motor-generator set, a controller, and a drive motor, any of which may be mounted any distance from the others and in any position. A single controller provides 16 forward and 16 reverse steps of speed adjustment of 150 rpm each to a total of 2400 rpm and provides full dynamic braking. A vernier rheostat may be connected in the circuit

(*Continued on page* 212)



IDEAS FOR FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

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General Electric Co.—Exact indication and control of temperatures is possible with various pyrometers described in 12-page illustrated bulletin GEC-713. Applications, ranges and prices are included.

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Gardner-Denver Co. — Two-stage water-cooled compressors, driven by engine or motor have displacements up to 686 cfm. All the dope on these efficient compressed air producers is found in 12-page bulletin WB-10. Get a copy.

52. Core Ovens

Foundry Equipment Co. — Heated with gas, oil or electricity, Coleman portable shelf type, rolling drawer and laboratory core ovens include internal and external recirculation models. They're detailed in bulletin 206. Of cores you want a copy.

53. Impact Is What Counts

Chicago Pneumatic Tool Co.—16-page illustrated bulletin 812-8 should have some impact on your operations as it details sizes, specifications and features of air-powered impact wrenches. Bolts from ¼ to 1¾ in. can be driven. Let air—and this bulletin—help you out.

54. Guide To Tapping

Cleveland Tapping Machine Co. — All the figures, data and other dope your estimator, setup man or operator will need for production tapping is in this swell 28-page "Production Tapping Guide." Everything's here!

55. Induction Furnaces

Russ-Holt Corp.—Illustrated Reports No. 3 and 4 explain advantages offered by System Russ low frequency induction furnaces for melting iron and nonferrous alloys. Linings last between 20 and 24 months in the toughest kind of service. That's a lining what am!

56. How's Your Temperature?

Illinois Testing Laboratories, Inc.—If you have any equipment which needs its temperature taken, and what foundry hasn't, you'd better get a copy of 16-page illustrated bulletin 4561. It deals with Alnor pyrometers for temperature measurement.

57. Hoist Away!

Chisholm-Moore Hoist Corp. — So you think a hoist is a hoist. Not so if you peruse 22-page illustrated bulletin 142-D. All types of hoists with various types of suspensions, trolleys, capacities and controls are shown. Also read about features and accessories which let them do the job better.

58. Grinding Wheels

Electro Refractories & Alloys Corp. —64-page wire-bound booklet entitled "High Speed Grinding" illustrates and describes line of grinding wheels. Among many items covered are abrasives, bonding, special shape wheels, wheel speeds and safety recommendations. Back cover pockets a handy plastic wheel speed calculator. It's all yours for the asking.

59. Air Your Problems

Scovill Mfg. Co., A. Schrader's Son Div. — 72-page catalog 15 is jampacked with pictures and info on products which put air to work. Some of the blow guns, quick-acting couplers, hose and fittings, hose reels, clamps, cylinders, air controls and gages will simplify the tasks in your plant.

60. Coping With The Cupola

Whiting Corp.—"How to Make Your Cupola Operations More Efficient" is not only quite a problem in light of today's shortages in material and manpower, but happens to be the title of 6-page bulletin FO-1 that will give you some answers on just those problems. Why don't you cop this one?

61. For Better Results—

Atlantic Chemicals & Metals Co.—Immunitas products for better results in casting, smelting or refining are described in illustrated catalog 61. Fluxing agents, Zincorex DT for zinc fluidity and Coppex for decreasing casting porosity are among products covered. Services to ferrous and nonferrous operations are listed.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

FOUNDRY
Penton Building, Cleveland 13, Ohio

1-52

Please send literature or detailed information on subjects circled at left to—

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5	17	29	41	53	65	77	89	101	113
6	18	30	42	54	66	78	90	102	114
7	19	31	43	55	67	79	91	103	115
8	20	32	44	56	68	80	92	104	116
9	21	33	45	57	69	81	93	105	117
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62. Crowing About Croning

Union Carbide & Carbon Corp., Bakelite Div. — Excellent photographs and text are used to give reader of 16-page booklet K-8 an insight into use of Bakelite phenolic resins for Croning process. Advantages of process for making foundry molds and cores are in this valuable piece. Better get it now!

63. Overhead Cuts Overhead

Cleveland Crane & Engineering Co., Cleveland Tramrail Div.—How Tramrail installations can cut handling costs from 10 to 50 per cent, eliminate rehandling and speed up production are shown in 12-page illustrated manual C-2303.

64. Pressure or Vacuum

Fuller Co.—16-pages of worthwhile information on rotary compressors and vacuum pumps comprise illustrated bulletin C-5. There's a size and type machine for every foundry need.

65. Melting Furnaces

Eclipse Fuel Engineering Co.—All the facts and figgers on SM melting furnaces are given in 2-page bulletin C-1A. For use in melting zinc, tin, lead, aluminum and other soft metals, furnaces have 4½-in. first quality firebrick, 2½-in. insulation in sidewall and tapered rammed refractory bottom. Get it—today!

66. Money Saving Ideas!

Ingersoll-Rand Co.—Although not one of *the* Pocket Books, this 32-page "Little Book with Big Money Saving Ideas" will fit in your pocket. About 87 case histories show how air power has instituted savings. Ideas are indexed under three titles: Industry, Application, Product. Send for this one!

67. Pattern Protection

McDougall-Butler Co. — Patterns are valuable. Protect them with Hardlac improved pattern coating. Full information on this oil, water, wax and gasoline resistant finish is given in 4-page illustrated folder. Coating prevents warp, swell, wear and deterioration.

68. Bulk Materials Movers

George Haiss Mfg. Co.—Whether it's sand, scrap, coke or castings, it can be handled with speed on sectional conveyors of the type described in 8-page illustrated bulletin H 487. Get a move on! There's a size and type for your foundry bulk materials handling problems.

69. Air Compressors

Joy Mfg. Co.—This line of air compressors for every industrial need will really "gave 'em the air." Models from 1.6 to 3656 cfm and ¼ to 600 hp are listed and specifications given in 4-page illustrated bulletin M-201.

70. Special Handling Equipment

Powell Pressed Steel Co.—Here, friends, is a 6-page illustrated folder that offers dope on several types of special handling equipment for transporting hot billets, castings, bulk materials, etc., etc. You will see stacking pallet boxes and racks, foundry funnel boxes, forging skip, roll-over fork box, hopper box, dump bottom units and others.

71. Slip Jackets & Core Plates

Johns-Manville—Transite is lightweight, corrosion and heat resistant, warp-proof, easily cleaned and practically indestructible. That's why core plates and slip jackets made from it are so durable. Sizes and types are shown in 4-page bulletin PP21A. Get a copy.

72. Sand Mixer—Mullers

National Engineering Co.—6-page bulletin 511 presents descriptions, features, illustrations and specifications of model 2F and 3F Simpson intensive sand mix-mullers. Machines make possible high muller pressures with minimum of muller inertia. (Mull that over a little!)

73. No More Hot Air

Harvey P. Bertram Co.—Air your air fan problems by sending for this 20-page illustrated brochure on "Industrial Air Fans." It describes line of fans which incorporate the latest in airfoil design. There's capacity charts for 12 sizes ranging from 14-in. to 72-in. diameter fans. Be an air fan and send for this booklet right away.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

74. Core Driers

American Cyanamid Co.—"Reinforced Plastic Core Driers" is title of 2-page illustrated reprint describing core driers made from resin reinforced with Fiberglas. These driers support cores of complicated shapes on their travel though electronic baking ovens. Get to the core of things with this reprint.

75. More on Boron

Molybdenum Corp. of America—Here's one that won't bore you. It's a 4-page reprint presenting the "Effect of Boron on Cast Iron." Author discusses this metal's adaptability to cast iron for savings in scarce conventional alloys. Why not send for it?

76. Aluminized Cast Iron

Whitfield & Sheshunoff, Inc.—This one's all about hot dip aluminizing of cast iron. It's a 4-page illustrated reprint entitled "Aluminized Cast Iron" and describes a process suitable for ferrous and nonferrous metals. Pictures and tables are included.

77. Planning for Mobilization

United States Pipe & Foundry Co. —You'll want to get this informative 4-page reprint entitled "Company Mobilization Planning" which outlines an industrial plan for foundries that gives a picture of facilities and personnel which can contribute to defense. Get it, and you'll not get caught with your plans down.

1	13	25	37	49	61	73	85	97	109
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3	15	27	39	51	63	75	87	99	111
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12	24	36	48	60	72	84	96	108	120

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• You're bound to agree, once you've tried SUPER-ANNEALSHOT. Metal Blast's fast-growing list of satisfied customers, engineering reports proving top performance and steady repeat orders—are undeniable evidence of the superiority of SUPER-ANNEALSHOT.

What's more, you need never pay a premium for Metal Blast abrasives. They're never priced above prevailing market levels —often sell for less!

For better malleable shot—always specify SUPER-ANNEALSHOT. If you prefer hard shot and grit of the same unexcelled quality —specify ANNEALSHOT.

FULLY GUARANTEED

Order with confidence! If you don't find SUPER-ANNEALSHOT and GRIT superior to any malleable abrasives you've ever used— return the un-used quantity for refund, at our expense.

Swim suit by Jantzen

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METAL BLAST
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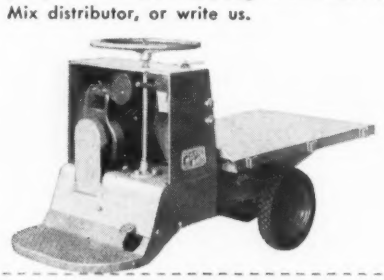
WITH KWIK-MIX **Moto-Bug**®
POWER WHEELBARROW

- This low-cost power wheelbarrow takes *all* the high costs and hard work out of material handling . . . hauls 10 cu. ft. (struck) of bulk materials, or 1500 pounds, in big-capacity hopper.
- Moto-Bug has full power forward *and* reverse . . . no push, no pull necessary for traveling, backing up, or spotting. Reverse is *instantaneous* . . . no need to swivel steering wheels for reverse-direction travel.
- Climbs 20% ramps or grades fully loaded . . . there's plenty of traction because 75% of loaded weight is on front drive tires. Dual drive tires are optional . . . rear dual steering wheels are standard equipment.
- Operator rides on rear step . . . large steering wheel, with 3.6-to-1 gear ratio, provides effortless steering and maneuvering. Moto-Bug turns in its own length . . . 33" width clears narrow aisles, doorways.
- Other Moto-Bug advantages: Instant gravity dump, with snub-line control . . . and 5-ft. scraper blade, which attaches to Moto-Bug without need for removing hopper.
- Interchangeable units: 1500-lb. flat-bed (below) . . . 500-lb. fork lift with manual pump, or 1000-lb. fork lift with power-driven hydraulic pump. Get more Moto-Bug facts from Kwik-Mix distributor, or write us.



Send for complete Moto-Bug facts to: **KWIK-MIX CO., Port Washington, Wis.**

NAME ..... TITLE .....
COMPANY ..... DEPT. OR DIV. .....
STREET .....
CITY ..... STATE .....

KM255FO

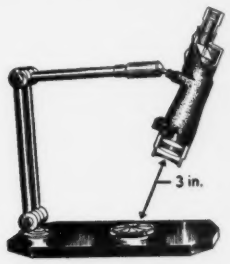
KWIK-MIX COMPANY
PORT WASHINGTON, WIS.
Koehring Subsidiary

(*Continued from page* 208)

if finer adjustment is required. Sizes are ¾-hp through 3 hp for operation from polyphase circuits and ¾-hp through 1½-hp for operation from single phase circuits.

For More Details Circle No. 12—Page 209

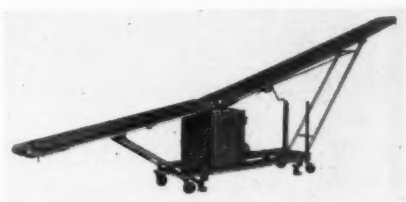
Microscope: Edmund Scientific Corp., Dept. 97, Barrington, N. J.—Universal mount permits 35 power erecting microscope to swing freely in any direction, facilitating examina-



tions from any angle. Joint tension of the mount is adjustable. Prism erectors give viewer an erect, right-side-up image. Instrument provides fine precision focusing and a 1-in. diam three-element color corrected objective. Microscope body is brass with black crackle finish. Working distance from objective to object is almost 3 in., permitting work on the object while under observation. Instrument is 6½-in. long, and the base measures 7 x 9 in.

For More Details Circle No. 13—Page 209

Conveyor: Mathews Conveyer Co., Ellwood City, Pa.—Belt conveyor, with power-driven receive section, features a reversible belt. Power-receive section takes packages efficiently from roller and wheel conveyor



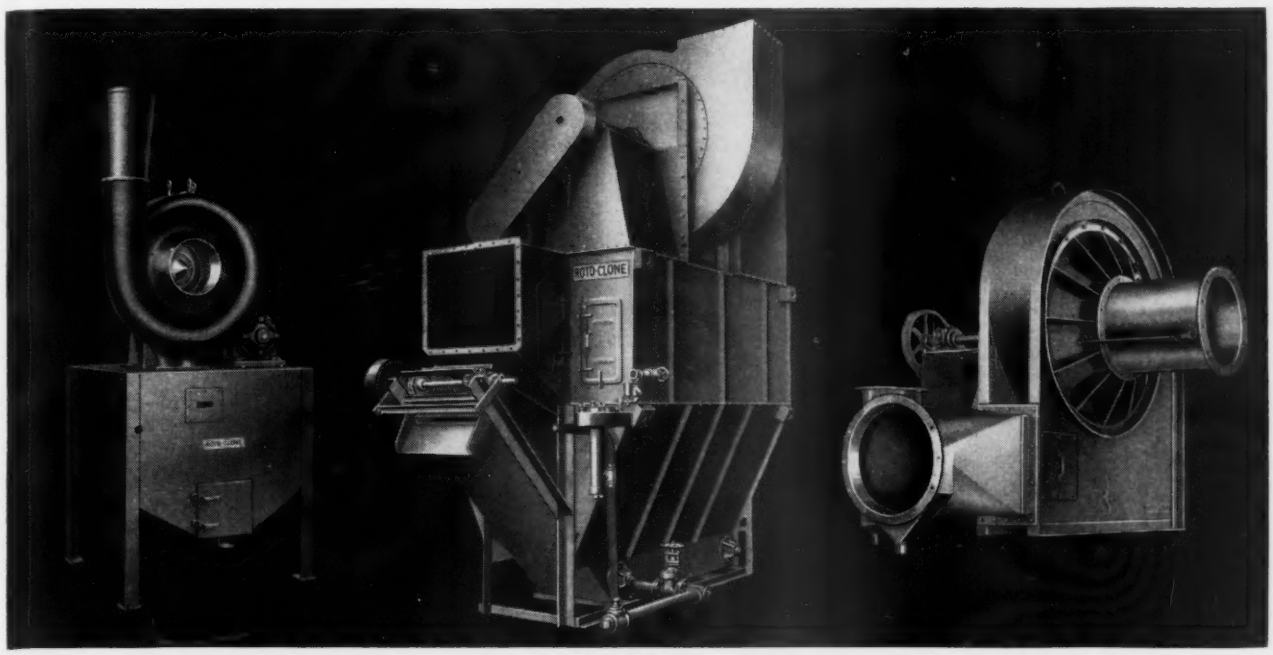
lines. Unit may be moved easily over plant floors to the point of use. Conveyor is furnished with motor, starter and cord, ready to operate. It is available with 12 and 16-in. belt widths in units of 12, 16 and 19 ft long.

For More Details Circle No. 14—Page 209

Lift Trucks: Buda Co., Harvey, Ill.—Pneumatic-tired fork lift trucks of 2000-lb capacity are rated at 15 and 24-in. load centers. Features include carriage mounted on adjustable side thrust rollers to eliminate wear; extra strength and self-aligning mast; single lever two-speed forward and

(*Continued on page* 214)

clean air costs less than dust!



Type D ROTO-CLONE
Arrangement B

Type N ROTO-CLONE
Arrangement C

Type W ROTO-CLONE
Arrangement A

ROTO-CLONES GIVE YOU
engineered dust control

AAF ROTO-CLONES are made in types, sizes and arrangements that solve most problems of industrial process dust . . . simply and efficiently, at lower cost. This is true of all three basic types of ROTO-CLONES • Type D for Dry collection • Type W for wet collection • Type N for hydrostatic collection. Each of these ROTO-CLONE types is furnished in several arrangements . . . the arrangement determining the method of disposal for the collected material.

To eliminate your dust problems with "Engineered Dust Control" call your nearby AAF representative or write direct for Dust Control Bulletin No. 270A.

ARRANGEMENT B

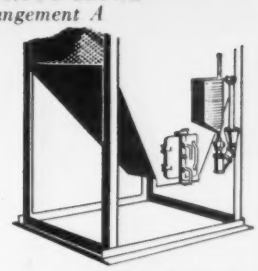
Hopper provides storage space for collected material, which is disposed of manually. Available for all types.

ARRANGEMENT C

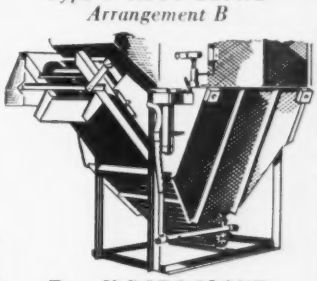
Storage hopper with sludge ejector for continuous removal of collected material. Available for Type N and Type W.

ARRANGEMENT D

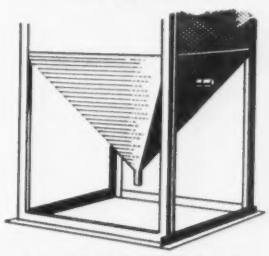
Storage hopper with bottom outlet for continuous removal of collected material by sluicing for Type N and Type W . . . or by rotary valve for Type D.



Type W ROTO-CLONE
Arrangement B



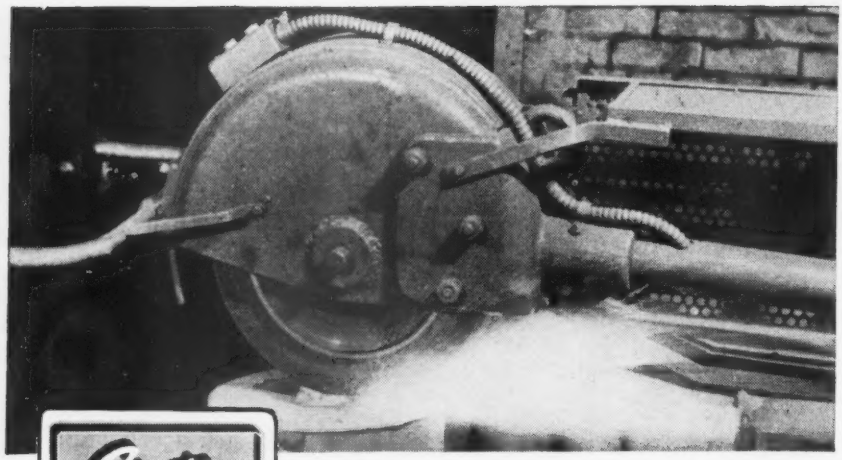
Type N ROTO-CLONE
Arrangement C



Type W ROTO-CLONE
Arrangement D

American Air Filter
COMPANY, INC.

266 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P.Q.
Pacific Division Office, San Francisco, Cal.



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ABRASIVE WHEELS FOR

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PRECISION GRINDING

SNAGGING

GRINDING WHEEL MANUAL 645 AND SPEED CALCULATOR

Free on Request
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3-Way Gains

You can get it straight from any production executive that he gained three ways when he turned to Electro engineered-to-*his*-job, high speed grinding wheels.

He gained in speed, economy in wheel and operating costs, and in quality of output.

Our resources and facilities permit full latitude in the manipulation of grits, bondings and wheel forms. Therefore, whatever your requirements, you can depend upon Electro to produce wheels to give you these 3-way gains.

Write, wire or phone us. We'll send a field engineer to prove it by doing it.

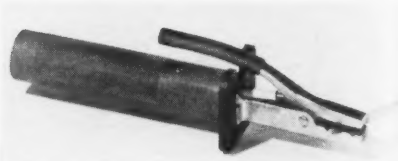
Electro Refractories & Abrasives Corporation
344 Delaware Avenue, Buffalo 2, N. Y.
WEST COAST WAREHOUSE: LOS ANGELES 58. PLANTS IN BUFFALO, N.Y. AND P.Q., CANADA K-411

(*Continued from page* 212)

two-speed reverse gear shift, complete compliment of gages and switches on full front vision instrument panel; and quick change heavy duty clutch. Powered by a four-cylinder engine, the trucks are available in five standard masts with a lift of 72, 84, 108, 114, and 120 in.

For More Details Circle No. 15—Page 209

Electrode Holder: Erico Products Inc., 2070 East 61st Pl., Cleveland 3 — Semi-insulated electrode holder is available in 300 and 500 amp capacities. Holder features a



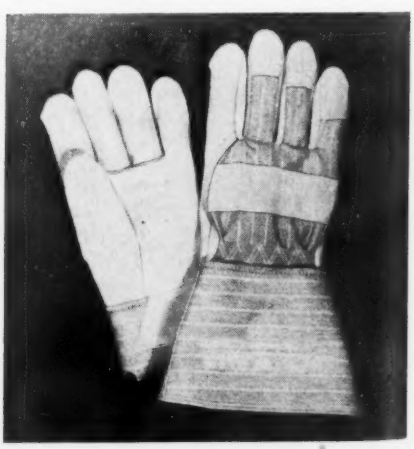
guard that protects the welder's hand from spatter, arc and reflected heat; greater heat dissipation by a newly designed channel construction of the body; solid copper circuit from welding machine to electrode holder with no hot spots; coil spring assembly enclosed inside the handle to avoid damage by arcing or spatter, and an extra large hinge pin which reduces play of the tong after hours of continuous operation.

For More Details Circle No. 16—Page 209

Light: Jones Metal Products Co., Lighting Division, West Lafayette, O.—New, all-purpose light is designed to fit any standard socket. It has a porcelain enamel reflector and is a practical and easy to use light, supplying concentrated illumination where needed.

For More Details Circle No. 17—Page 209

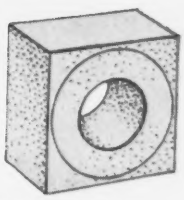
Gloves: Peerless Glove Co., Grand Haven, Mich.—Leather work gloves feature an extra heavy work



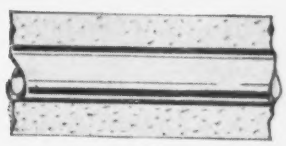
welt sewed into the seam where the two middle fingers join the palm piece. It is designed to absorb the

(*Continued on page* 216)

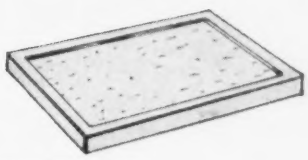
We're finding new uses every day for versatile **KAOCAST**



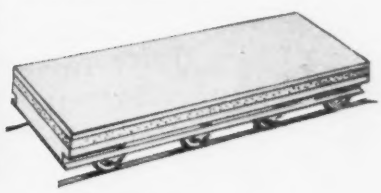
KAOCAST Burner Blocks



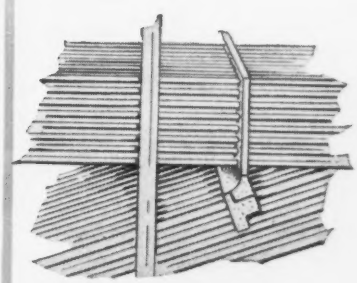
KAOCAST Covering for Water Cooled Furnace Tubes



KAOCAST Door Lining



KAOCAST Car Top



KAOCAST Boiler Baffles

Even our Field Engineers are surprised to discover the amazing variety of uses for versatile Kaocast. This unique 3000 degree refractory castable has been put to work in scores of imaginative applications where it has paid off in lower installation costs, faster repairs, longer service life. Here are a few examples:

- **Kaocast replaced firebrick in door linings... lasted 3 to 6 times as long, cut costs in half.**
- **In a tunnel kiln, ordinary castables used for covering car tops crumbled after a few trips. Kaocast stayed on the job for 30 trips without deterioration.**
- **Versatile Kaocast proved "better than anything previously used" for piers of a stoker-fired boiler.**
- **This jack-of-all-refractories performs so well that one central station keeps a large stock on hand for miscellaneous jobs.**

Are you missing a money-saving opportunity to use versatile Kaocast? Ask your B&W Field Engineer to give you additional facts and figures . . . to help you profit with Kaocast. • KAOCAST is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.

BABCOCK & WILCOX

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R-401

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This compact Holcroft furnace anneals, descales and desands castings at a production rate of 10,000 lbs. per hour.

Not only that, but it delivers the castings at a lower cost per piece.

Foundries all over the country depend upon Holcroft to give them the furnace help they need. That's because Holcroft is such a well-known leader in the field. Many foundry practices, standard procedure today, were basic ideas worked out by Holcroft engineers.

You, too, can take advantage of this furnace know-how. Write today for complete information. **Holcroft and Company, 6545 Epworth Blvd., Detroit 10, Michigan.**

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

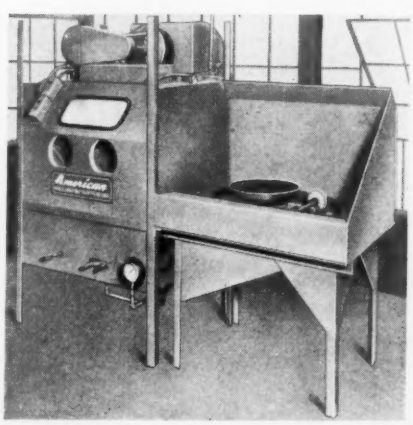
CHICAGO 9 — C. H. Martin, A. A. Engelhardt, 4209 South Western Blvd.
CLEVELAND 15 — Wallace F. Schott, 1900 Euclid Ave.
HOUSTON 1 — R. E. McArdle, 5724 Navigation Blvd.
CANADA — Walker Metal Products, Ltd., Windsor, Ontario
EUROPE — S. O. F. I. M., Paris 8, France

(*Continued from page* 214)

major amount of friction and wear which is heavy in this area of the glove. Gloves are made of chrome tanned split cowhide and have a knuckle strap, finger tips, and full leather thumb and forefinger. Elastic across the back of the glove assures a good fit at the wrist. Gloves can be supplied with either a gauntlet cuff or shorter safety type cuff.

For More Details Circle No. 18—Page 209

Blast Machine: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind. —Wet blast machine for cleaning castings features a vertical pump for slurry recirculation which eliminates all suction piping, valves, and fittings. It is said to be always primed by flooded-type suction, and the operation of valves for starting or stopping is unnecessary. Loss of slurry through leakage is eliminated be-



cause there are no packing glands. Abrasive cannot plug the pump impeller when the machine is shut down, and the hopper need not be drained before the pump is removed. Armholes have gauntlets so that every workman can use his own gloves, and small work can be passed through the armholes without opening the doors. Gauntlet drainage is designed so that no slurry drips down the front of the cabinet. A reset timer is available which tells at a glance the number of blasting hours that the abrasive has been in the machine. No manual handling of slurry is necessary; an air ejector is available for blowing the slurry through a hose, either to sump pit or barrels.

For More Details Circle No. 19—Page 209

Band Saw: DoALL Co., 254 North Laurel Ave., Des Plaines, Ill.—Design change in the mounting of saw tables on the company's band saw machines is said to increase rigidity, minimize deflection under load and eliminate vibration of the work table. Lower saw guides can be raised above

(*Continued on page* 218)

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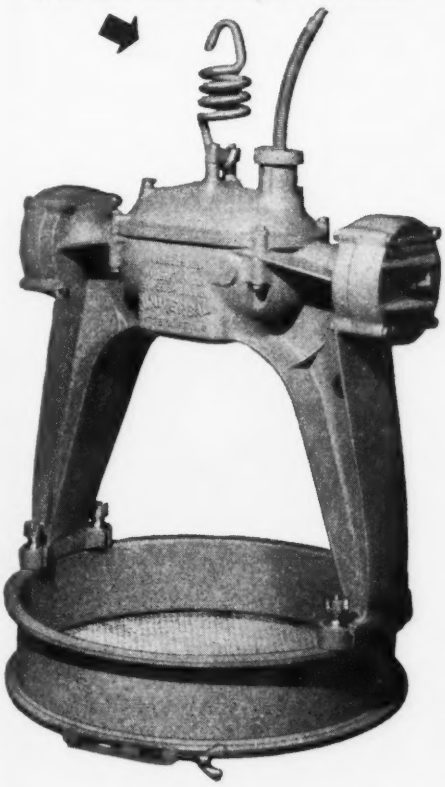

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The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

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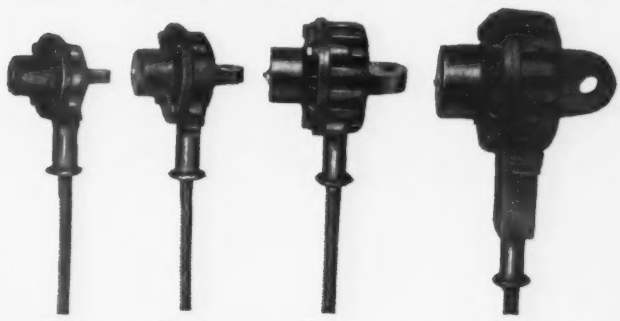

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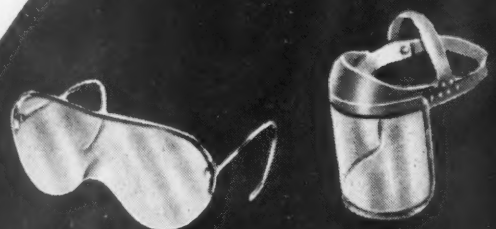

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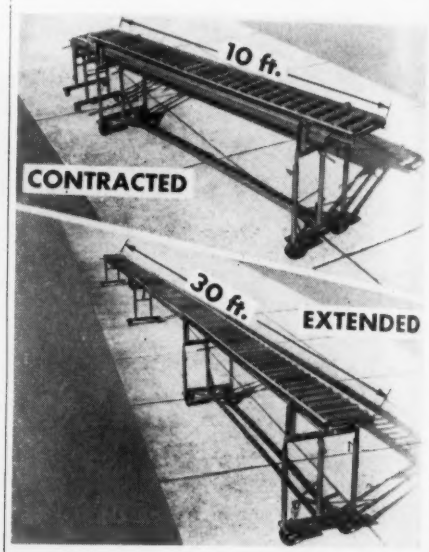
(Continued from page 216)

the work table surface to give increased support to the blade. This change is of importance when an auxiliary table is used so the lower guide can be brought up very close to the work. A locking nut and ratchet type locking lever enable the table to be set securely at any angle up to 45 degrees right and 10 degrees left.

For More Details Circle No. 20—Page 209

Telescopic Conveyor: Wilkie Co., 5520 Arch St., Philadelphia 39—Telescopic, roller-type conveyor is said to be easy to pull out and push in and may be rolled from one job to another with minimum effort. It is offered in 12 and 18-in. width and



nine different lengths which extend to a maximum of 30 ft. When extended, the sections pull up even.

For More Details Circle No. 21—Page 209

Ring Packing: Johns-Manville, Box 290, New York 16—New ring packing is a molded packing, and each ring is a complete, self-contained packing unit. It is designed for maximum sealing efficiency in minimum packing depth so stuffing box sizes can be reduced. It is said that no follower or header rings are needed. Each ring centers itself on the preceding ring. The packing does not depend on gland pressure for sealing, thus friction is reduced and there is less wear on both rod and packing. Offered in varied compositions to suit different services—water, steam, oil, air, gas, vacuum—it is furnished in sets of endless or split rings for shafts $\frac{5}{8}$-in. in diam and up.

For More Details Circle No. 22—Page 209

Air Analysis: Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44—Instrument for automatic analysis and recording of air pollution by

(Concluded on page 220)

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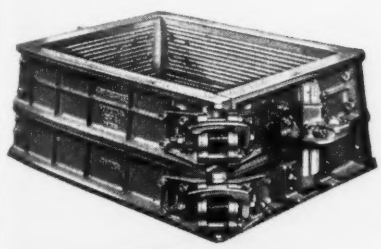
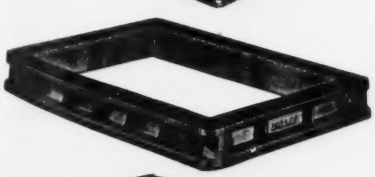
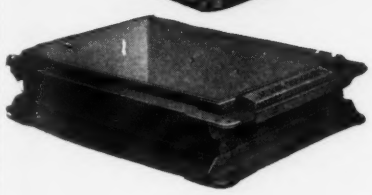
10" Post Type
Universal
Jolt Squeezer
Portable Type







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(*Concluded from page* 218)

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For More Details Circle No. 23—Page 209

Lifting Magnet: Coles Cranes Inc., Dept. 10, Box 942, Joliet, Ill.—Company is distributor for a British lifting magnet which is said to feature light weight and economical current requirements. Magnet is easily

dismantled and worn parts can be replaced or repaired with minimum delay. Magnet consists of high permeability cast steel core and back plate. Core and back plate are of steel and the outer ring which normally receives rough usage, is a rolled steel ring.

For More Details Circle No. 24—Page 209

Lift Trucks: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Company has added five new models to its line of industrial lift trucks. Three of the new models, replacing three models formerly produced, have solid or cushion tires and a shorter wheelbase. The other two feature pneumatic tires on all wheels. Model 480-P has 48-in. wheelbase, capacity of 4000 lb at 24-in. load center, and pneumatic tires. Model 390 has a 39-in. wheelbase, capacity of 3000 lb at 15-in. load center. Model 400-P has a 40-in. wheelbase, 2000-lb capacity at 24-in. load center, and pneumatic tires. Model 420 has a 42-in. wheelbase and 4000-lb capacity at 15-in. load center. Model 460 has a 46-in. wheelbase and capacity of 4000 lb at 24-in. load center.

For More Details Circle No. 25—Page 209

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Hardened Gray Iron

(*Continued from page* 95)

that resistance to wear due to sliding friction and abrasion is of greater importance than corrosion resistance in diesel engine service.

Summary of Wear Test Results—In general, the wear test results evidenced that, in diesel engine service, a variety of hardened alloy gray irons have very good wear resistance as compared to gray irons of usual hardness. The wear resistance of hardened sleeves is in the range of from three to five times that of unhardened sleeves. Hardened, unalloyed, fairly low carbon gray iron of proper hardness and structure has wear resistance on a par with hardened alloyed gray irons. The use of unalloyed gray iron in sleeves to be hardened is limited to relatively thin sections, if high hardness is desired, due to the shallow hardening properties of the unalloyed iron.

High-chromium irons have excellent wear resistance but are themselves "abrasive". In addition, their high cost, difficult machinability and the lack of suitable piston rings to use with them prevent their use.

On the basis of one engine test only, unhardened, high nickel-chrome gray iron of about 200 brinell hardness has shown very good wear resistance. The relatively poor wear resistance shown by austenitic gray iron of rather low hardness, the fair wear resistance of "Ihrigized" steel and the corrosion test data indicate that corrosion resistance is of less importance than hardness and structure.

Hardenability of Gray Irons—Hardenability of unalloyed low carbon iron and of a low-carbon nickel-chrome-molybdenum iron are shown graphically in Figs. 1 and 2. The results shown were obtained by using the standard bar and procedure developed by Jominy and Boegehold[2]. The curves show the shallow hardening properties of the unalloyed iron and the deep hardening properties of the alloy iron. They show graphically why the unalloyed iron is unsatisfactory for heavy sections if high hardness is desired.

Heat Treatment of Cylinder Sleeves—All sleeves and liners to be hardened are subjected to an annealing operation before machining. This operation relieves strains in the castings and, in addition, softens them, making them easier to machine. After machining, with sufficient stock allowed for finish grinding and honing, the sleeves are heated to above the transformation range, soaked, oil

(*Continued on page* 224)

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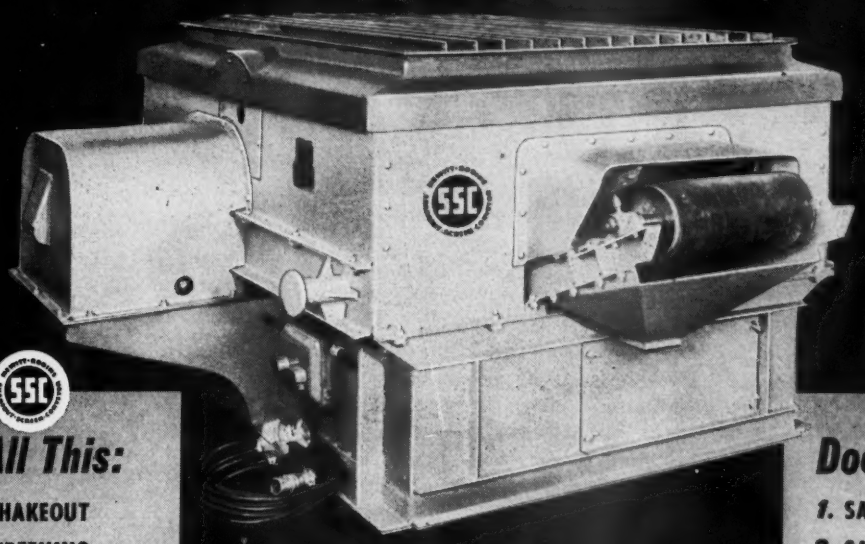

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Think of it! A Shakeout . . . a Sand Screen . . . a Lump Breaker . . . a Feeder Belt Conveyor and a Tramp Metal Trap —all in one compact, self-contained, portable unit taking up no more space than a standard portable foundry shakeout. That's exactly what you get in the new Hewitt-Robins SSC unit. With it, your entire shakeout and sand handling operation is completed in a matter of minutes . . . more thoroughly, more economically, more efficiently than ever before! Here's what it does:

FLASK SHAKEOUT. The loaded flask goes on the deck of a time-tested Robins Floatex® Shakeout. Castings, risers, gaggers, etc., are quickly released for easy removal from the deck.

SAND SCREENING. Sand passes through an integral hopper onto a screening deck equipped with non-blind cloth. This deck is actuated by the shakeout vibrator; no extra motor or other equipment needed. (Here sand receives the second of *three* aerations during reclaiming.)

LUMP BREAKING. Loose sand falls through the non-blind cloth and passes under a self-activating lump breaker. Any small sand supporters still present are automatically discharged.

CONVEYOR FEEDING. After passing through the screening deck, the sand falls onto a Hewitt-Robins Belt Conveyor with a Maltese Cross® Fiberglas Belt capable of withstanding 350°F. Conveyor delivers sand directly into your conditioner or to any other means of delivering elsewhere.

TRAMP METAL TRAPPING. Metal particles small enough to pass through the shakeout deck and the screening surface are trapped by the permanently magnetized head pulley on the conveyor, and fall into a tote box or other receptacle placed beneath it.

The SSC Unit saves time; it's fast, completely automatic. It saves space; does five operations in one compact unit! It saves money; no costly screen to buy. It saves power; requires only 8¼ H. P. It saves maintenance; fewer parts to service or replace. It will be the greatest low-cost producer in your entire plant! Write for Bulletin 136, giving complete details, to Robins Conveyors Division, Passaic, N. J.

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(*Continued from page* 222)

quenched to harden, and then drawn at a rather low temperature to strenghten them.

Annealing — The annealing operations in our plants and on various sleeves follow:

1. Pusher type gas fired furnaces used.
2. Time to heat to temperature: 30 minutes up to 2 hours, 12 minutes.
3. Maximum temperatures: 1400°-1500° F.
4. Time at temperature: 1 hour to 1 hour, 15 minutes.
5. Cooling time in furnace: 2 hours, 24 minutes to 3 hours.
6. Temperature on removal from furnace: 700°-800° F.

Hardening — These operations are covered by the following:

1. Gas fired pusher and rotary type furnaces used.
2. Time to heat to temperature: from 24 minutes for 1/16-in.-thick sleeves to 48 minutes for 5/16-in.-thick sleeves.
3. Maximum temperature: 1550°-1600° F.
4. Time at temperature: from 10 minutes to 40 minutes.
5. Quenched vertically on expansion arbors in oil at from 100°-115° F.

Drawing—These operations are performed as follows:

1. Forced air gas fired type furnace used.
2. Heating time: 34 minutes for thinnest to 2 hours for heavier sleeves.
3. Drawing temperature: 400° F.
4. Cooled in air.

Hot Quenching — Some work was done on hot quenching dry liners a few years ago to reduce distortion and to permit finish honing of service liners at the factory with the out-of-round condition encountered on removal from pot chucks minimized.

As is well known, gray irons that are hardened by oil or water quenching are extremely brittle in the as-quenched condition. Their toughness is increased by progressively higher drawing temperatures but the toughness so attained never exceeds the toughness of the as-cast material. Toughness and distortion are related properties.

When gray irons are hot quenched it is possible to obtain toughness that is much greater than obtained in the as-cast condition. This is illustrated by the data in Table V. Results shown are averages of two or more tests. The iron used in these tests was for experimental cast crankshafts and had this analysis: Si 2.02, TC 2.86, S 0.067, P 0.124, Mn 0.59, Ni 1.23, Cr 0.20, Mo 0.99, Cu 0.17.

Piston Ring Data—Compression piston rings of alloy gray iron with hardness in the range of brinell 230-270 were used in the majority of wear tests described. Tests have been made using hardened piston rings with hardened sleeves. Wear of the rings was reduced when using hardened material, but "wearing in" or "seating" of the rings was not satisfactory—blowby resulted, and tests on hardened rings were discontinued. More recently, tests of unalloyed gray iron rings of about the same hardness as the alloyed unhardened rings have shown the unalloyed rings to be quite satisfactory.

Intensive research and experience with aircraft and automotive engine service on the part of piston ring producers have resulted in notable developments in the production of alloy gray iron rings with physical properties much higher than those available in the past. These developments, plus others, such as chrome plating of top compression rings, should lead to continuing improvement in piston ring properties for all types of automotive applications.

Physical Properties of Heat Treated Iron—Tensile strength and hardness of heat treated alloyed and unalloyed low carbon irons have been determined and are shown graphically in Figs. 3 and 4. The charts cover these properties of the irons in the as-cast, annealed, quenched, and quenched-and-drawn conditions. The drawing ranges covered were 300°-1500°F. The alloyed iron chart was prepared in 1936 when that metal was used in production, hardened sleeves, while that for the unalloyed iron was drawn more recently.

In connection with this charted data, it should be noted that hardness values obtained on machined sleeves and liners with metal sections of

(*Continued on page* 226)

TABLE V—Properties of High-Strength Alloy Gray Iron in As-Cast and Hot-Quenched Conditions

Condition	Transverse[1] Load-Lb	Transverse[1] Deft-In.	Tensile psi[2]	Impact Ft-Lb[3]	Hardness[4] Brinell	Hardness[4] Rock. "C"
As Cast	6,340	0.12	70060	44.8	316	30.5
H.Q. 900° F	4,890	0.11	41640[5]	33.2	444	46.5
H.Q. 800° F	5,850	0.14	63620	53.2	363	39.0
H.Q. 600° F	7,570	0.18	74640	83.0	277	28.0
H.Q. 450° F	7,730	0.15	82440	65.0	388	41.0

1. Transverse ASTM "B" bars 1.20 in. diam tested on 12.0-in. centers. 2. Tensile ASTM "B" bars 0.750-in. diam machined from halves of transverse bars. 3. Impact bars 1.125-in. diam, unnotched, machined from halves of transverse bars. Charpy test on 6.0-in. centers. 4. Hardness tests on cross section of transverse bars midway between center and edge. 5. Four tensile bars tested, all of which broke in threads. This value may be below true value.

TABLE VI—Typical Hardness Values of Bores of Wet Type Cylinder Sleeve with 5/16 Inch Wall Thickness After Heat Treatment

	Moybdenum-Chrome-Nickel	Copper-Chrome	Unalloyed Low Carbon
Top	51.0	51.0	50.5
End	49.0	48.5	50.0
	49.0	48.0	50.0
	50.0	49.0	50.5
Rockwell	50.0	49.0	50.5
"C"	51.0	48.5	49.5
	48.0	48.0	50.0
	51.0	47.0	50.0
	51.0	49.0	51.0
	51.0	51.0	51.0
Bottom	51.0	50.5	50.0
End	50.0	51.0	49.0
	51.0	51.5	49.5
Average	50.2	49.4	50.1
Equivalent brinell	499.0	484.0	497.

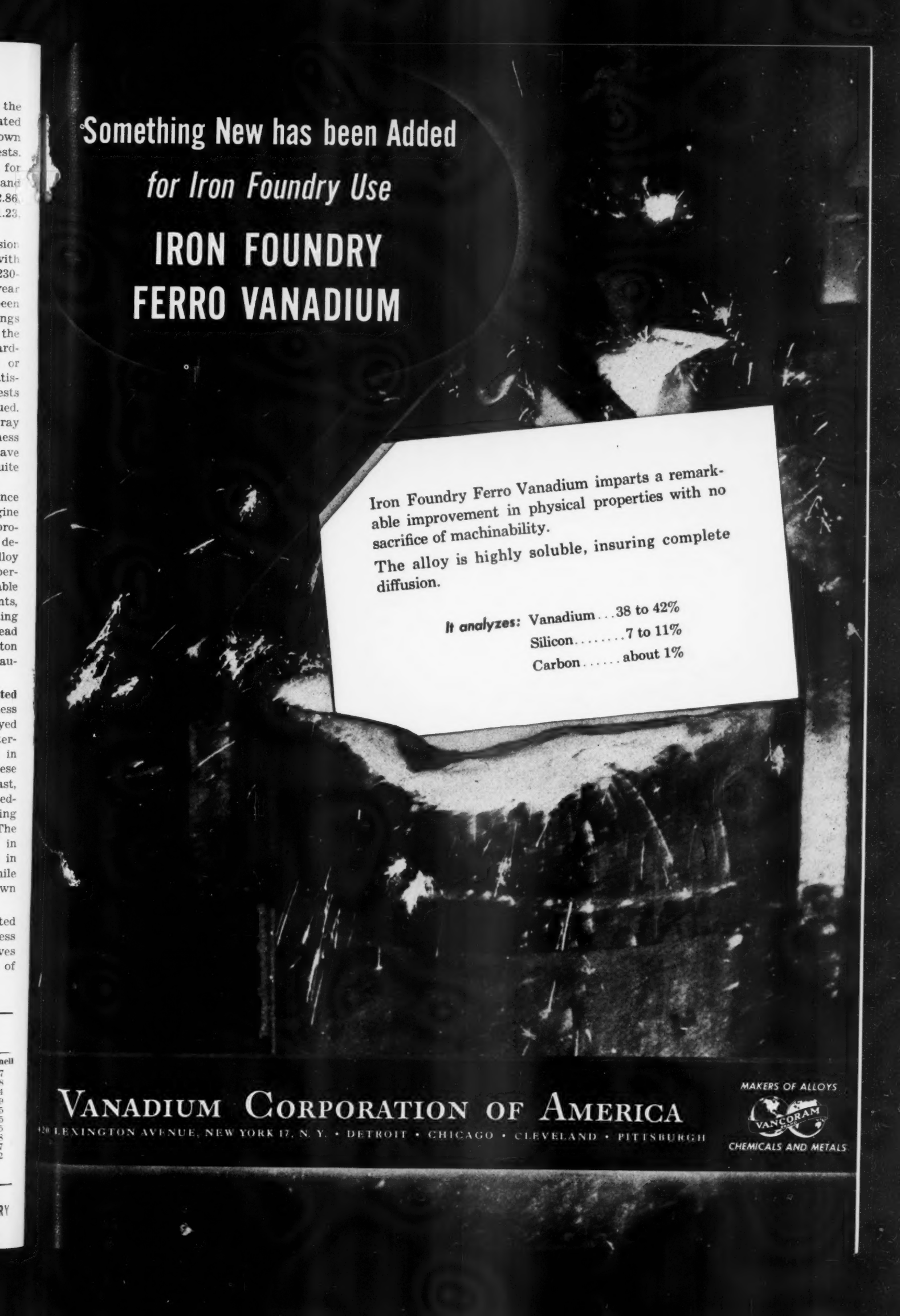
TABLE VII—Ni-Cr-Mo Gray Cast Iron

Condition	Tensile psi	Hardness Rockwell	Hardness Brinell
As Cast	44,500	C-23	239
Annealed 1550° F	41,440	C-10, B-91	187
Oil Quenched 1575° F	25,750	C-53	530
Drawn 300° F	35,900	C-52	520
Drawn 400° F	41,610	C-50	500
Drawn 500° F	54,075	C-48	480
Drawn 600° F	54,940	C-48	480
Drawn 900° F	57,110	C-40	394
Drawn 1200° F	55,550	C-31	298
Drawn 1500° F	38,675	C-12, B-92	192

Brinell values converted from Rockwell values.

TABLE VIII—Unalloyed Low Carbon Iron

Condition	Tensile psi	Hardness Rockwell	Hardness Brinell
As cast	39,850	B-93	197
Annealed 1550° F	23,700	B-64.5	108
Oil quenched 1575° F	23,500	C-45	444
Drawn 300° F	31,250	C-44	429
Drawn 400° F	32,975	C-43.5	415
Drawn 500° F	35,275	C-43.5	415
Drawn 600° F	39,575	C-43.5	415
Drawn 900° F	53,450	C-31.5	298
Drawn 1200° F	39,100	B-95	207
Drawn 1500° F	25,350	B-66	112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ALABAMA BY-PRODUCTS CORPORATION of Birmingham—one of the Nation's largest commercial coke producers—is now rushing to completion the fifth expansion program in its history. Because of the tremendously increased demand for coke from the Southeast's flourishing foundry trade, the Company is building a new battery of coke ovens which will bring its capacity to over 900,000 tons a year. It is likewise stepping up the output of its coal chemicals and by-product gas.

"Our large expansion program helps assure an ample supply of quality coke for the Southeast's fast growing malleable and grey iron industry," says Phil H. Neal, president of ABC. "Capacity of our plant has been increased more than fivefold since our Company was organized. Biggest factor in our growth has been the broad-scale industrial development throughout the Southeast. Another is Birmingham's superior location as a distribution center—not only for the whole Southeast but for all the 31 States we serve and our export markets in Canada, Cuba and Mexico."

ABC is one of scores of Birmingham district enterprises that have spiraled from small beginnings into nationally known industries. New plants will find even greater growth opportunities because of the accelerating progress of the South. Stake your claim now.

* * * * * *

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Tennessee Coal, Iron & Railroad Co.

(*Continued from page* 224)

from 1/16 to 5/16-in. are appreciably higher than the values shown. This is illustrated by the hardness tests of bores of cylinder sleeves cast with the three types of irons as shown in Table VI. In determining the values shown, threaded tensile test bars were machined from 1.20-in. diam transverse bars, the tensile bars being machined to a diameter of 0.500-in. All bars for each iron were cast with iron from one 2500-lb ladle of metal. The data on which the charts (Figs. 3, 4) are based are given in Tables VII and VIII.

Brinell hardness values shown were converted from Rockwell "C" for all values above 200 brinell and from Rockwell "B" for values below 200 brinell. All test results shown in Tables VII and VIII are the average of two or more tests.

The heat treatment schedule followed in making tests was the same in each case and was as follows:

1. Annealing: Heated to 1550°F; held one hour; furnace cooled to 500°F, then air cooled.
2. Quenching: Heated to 1575°F; held 30 minutes; oil quenched.
3. Drawing:

Temp °F	Time at Temp	Cooling
300	2 hrs.	Furnace cooled
400	1½ hrs.	Furnace cooled
500	1 hr.	Air cooled
600	1 hr.	Air cooled
900	30 min.	Furnace cooled to 500° F
1200	30 min.	Furnace cooled to 500° F
1500	30 min.	Furnace cooled to 500° F

Hardness of Sleeves After Wear Testing—Hardness tests on diesel sleeves after prolonged engine testing show that very little, if any, softening takes place or that, if it does take place, the affected metal is worn away. Hardness tests were made on the finish machined inside diameter of strips cut from lots of sleeves before and after testing. All tests made on hardened sleeves were Rockwell "C" tests and converted to brinell hardness values. In the early tests the scleroscope was used with converted brinell hardness values obtained that proved to be high when checked with the Rockwell. Values obtained on hardened nickel-chrome-molybdenum gray iron sleeves and on hardened graphitic steel sleeves before and after testing are shown below.

Type	Mo-Cr-Ni	Graphitic Steel
Before testing	Rock. "C" 50-54 Bhn 495-545	Rock. "C" 52-56 Bhn 514-556
After testing	Rock. "C" 50-53 Bhn 495-534	Rock. "C" 50-60 Bhn 495-627
Hours tested	1,253	2,704

Microstructures—Photomicrographs are shown in the fore part of this article of the structures of the molybdenum-chrome-nickel alloy iron used in production in the as-cast, annealed, quenched and quenched-and-drawn conditions over a drawing tempera-

(*Concluded on page* 228)

Simplest Production-Booster you ever saw!

Typical installation of Foxboro Air Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Controlling cupola blast by **weight of air** cuts pigging, ups quality, gives uniform pours

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The Foxboro Air Weight Controller automatically and precisely controls cupola air blast by weight — delivers the correct amount of oxygen for the quantity of coke in the charge. Regardless of ups and downs in atmospheric pressure or temperature, this simple, inexpensive accessory compensates for every change—insures better combustion, more uniform heats, and saves pigging.

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(*Concluded from page 226*)

ture range of from 300° to 1500°F. Composition of this particular iron is shown in Fig. 3. A similar set of photomicrographs for the low-carbon unalloyed iron is also shown.

In both sets the structure obtained after quenching is martensite with some scattered free cementite islands in the case of the alloy iron. As drawing temperature increases, a separation of cementite from the martensite occurs progressively in the form of granular small particles. In the case of the molybdenum-chrome-nickel iron the structure of the metal after the 1500°F draw consists of spheroidized cementite in a ferrite matrix with the free cementite islands remaining largely unchanged. In the case of the low carbon unalloyed iron after the 1500° draw the structure consists of free ferrite areas, areas containing spheroidized cementite in a ferrite matrix, some unusual lamellar areas and coarser graphite flakes. In other words, complete dissociation of a portion of the cementite has occurred with ferrite and coarser graphite resulting.

Also shown are microstructures of hardened and drawn copper-chrome alloy gray iron used as standard production material for some time, 24 per cent chromium iron and graphitic steel tested experimentally.

(*To be concluded next month*)

References

1. Teetor, M. O., "The Influence of Engine Design on Oil Consumption," *Proceedings*, ASTM. Vol. 35, 1935, pp. 591-607.
2. Jominy, W. E., and Boegehold, A. L., "A Hardenability Test for Carburizing Steel," *Transactions* ASM, Vol. 26, pp 574-599 (1938).

ASME Hears Two Papers On Gray Iron

Two papers relating to gray iron castings were presented at the annual meeting of the American Society of Mechanical Engineers at Atlantic City, N. J., Nov. 29. The presentation, sponsored jointly by the Metals Engineering and Production Engineering divisions, was presided over by R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J., and J. S. Vanick, International Nickel Co., New York.

"Design of Gray Iron Castings" was title of a paper by T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa. The other paper, "Physical and Mechanical Properties of Cast Iron," was given by W. Leighton Collins, University of Illinois, Urbana, Ill. A discussion of the latter paper by C. O. Burgess, technical director, Gray Iron Founders' Society, Cleveland, gave additional information on the engineering properties of gray iron and the design allowances that can be used in gray iron structures.

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American Tradition

(*Continued from page* 87)

for all types of people—the working class apartments, the middle-class apartments, and the first-class apartments—and they were very splendid living quarters. I was given a sales talk on the advantages of the Swedish Socialism Plan because many of the apartment houses were owned by the government or co-operatives. It all seemed lovely until I asked, "where are the garages?" They don't need garages, not even the first-class apartments, because of the limited number of automobiles. Standards of living are difficult to compare, but all an American need do is compare the many comforts and advantages that he takes for granted with the lack of them anywhere in Europe.

Some folks seem surprised to hear me say that we are in business for only one reason: "To make a profit." I do not accept all of the chastisement that has been heaped upon industry for its behavior in this competitive system of ours. It has made some bad errors of judgment, as we all have, but in the long run it has been profitable and has benefited all America.

Teachers Learn of Industry

I am reminded of an experience with a group of school teachers in the first Business-Industry and Education Day in which I participated at Iron Mountain, Mich. This is a program where the schools close down, and the teachers are distributed among the several industries of the community for a survey of the industry's plant. The small group of teachers that came to our foundry received not only a view of our business but received a pretty generous share of my philosophy. In the discussion, one of the teachers asked me what we did on the so-called human side of business, such as safety and the other "fringe benefits" for employees. On that particular day, I reported to her, our plant had operated 452 days without a single lost-time accident. I think you will admit that is pretty good for a foundry. We spend a great deal of money to prevent accidents.

Furthermore, I told those teachers that in 1924, and I asked them to note that date, our small company instituted a group insurance program which started originally with life and accident benefits and has since grown to include not only health and accident but hospitalization and surgical benefits for the employees and their

(*Continued on page* 232)

A New Year's Resolution:

INCREASE PRODUCTION
REDUCE COSTS

With HELP from

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FOUNDRY ENGINEERS

KNIGHT Services For Foundries:

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You can make this a bigger, better year by ironing out the problems that restrict production and limit profits. Hundreds of foundries have taken advantage of the experience and ability of Knight professional foundry engineers for unusual help—from modernizing one department to the design, layout and supervision of construction of a complete new foundry.

Knight Engineers have had years of successful experience in foundry management, production, engineering or equipment and are familiar with the operations of all types and sizes of foundries for all types of metals.

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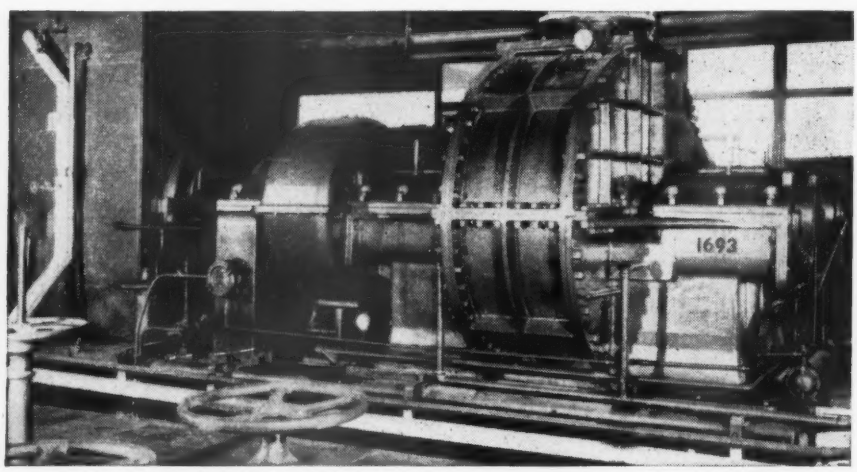
3. **Heat balance in the plant is maintained.**
4. **Savings in total power cost will pay for the new installation in about one year.**

These very satisfactory results were obtained by careful evaluation of all the factors before deciding upon the type of equipment . . . and then by specifying an R-C Rotary Positive Gas Exhauster that will do the work at low operating cost.



Type RCGH Rotary Positive Gas Exhauster, driven by 450 hp synchronous motor. Capacity, 20,600 cfm.

Even though your equipment to handle gas or air may still have years of life, it may be sound economy to replace it with modern, efficient, R-C units of the right type, size and drives to best meet your needs. Our engineers will help you analyze your problem and make unbiased recommendations of either Rotary Positive or Centrifugal equipment, depending upon your specific conditions. This *dual choice* is an exclusive R-C advantage.

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BLOWER BUILDERS R-C SINCE 1854
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(*Continued from page* 230)

dependents. In 1926, and note that date too, our company first gave paid vacations to the shop employees. At this point I called the attention of the teachers to the halo over my head for the humanistic attitude we took towards our employees and then suggested they watch it grow brighter as I say that three or four years ago we instituted a pension program for all of our employees, with the same formula applying to everyone, including the president.

Now, I said to them, watch the halo disappear while I ask myself and answer the question, "Why?"

Frankly, we spend money to avoid accidents because accidents are expensive. They cost money, not only for the doctor bills and the time lost, but they seriously interfere with pro-

THE AUTHOR

Much of what is typified by the "American Tradition" may be found in the successful industrial career of Wm. J. Grede, who last month was elected president of the National Association of Manufacturers. Born in Milwaukee in 1897, Mr. Grede attended the University of Wisconsin and entered the foundry industry at Decatur, Ill. At the age of 23 he went into business for himself, taking over the former Liberty Foundry Co., Wauwatosa, Wis. This small gray iron foundry formed the nucleus of what now is Grede Foundries Inc., employing more than a thousand workers, with Mr. Grede as president.

The corporation, formed in 1941, comprised a merger of the Liberty Foundry with the former Spring City Foundry, Waukesha, Wis., and the Milwaukee Steel Foundry Co. Smith Steel Casting Co., Milwaukee, was acquired the following year; in 1946 another foundry was built in Iron Mountain, Mich., and last April an idle foundry at Reedsburg, Wis., was acquired and returned to production. Mr. Grede is well known locally for his participation in civic affairs. For years he was active in foundry organizations, including the Wisconsin Gray Iron Foundrymen's Association, of which he was president, and the American Foundrymen's Society. His recent election to presidency of the National Association of Manufacturers followed five years as a NAM director and two years as a regional vice president.

"Selling the American Tradition" was presented before the 22nd annual meeting of the Gray Iron Founders' Society and also before the AFS Wisconsin Chapter.

duction. And if you have unsafe machinery, men are afraid to work at it and your production suffers. So we have found our accident prevention program very profitable.

Group insurance was started principally because in those early years every time a person in our organization died, they passed the hat and collected a few dollars which I was ashamed to deliver to the widow, so the company always added something to it and finally concluded that it would be much less expensive to incorporate a life insurance program. Furthermore, with this additional benefit for our employees, which, as I indicated, has been expanded to include all of the insurance coverage, we would make our working conditions better so that it would attract better people and persuade them to stay with us. In addition, if they were free from the worry of these hazards, their production would be better—we'd get 10 more molds per day.

Remove Parent's Worry

If we provide for little Johnny's tonsils to be removed, then big Johnny comes to work and doesn't have to worry about the hospital bills; he doesn't hesitate to have little Johnny's tonsils taken out when they need it, and in the meantime we get the benefit of big Johnny's production and the increased production that results from his lack of worry.

Our paid vacations were given primarily because we wanted to encourage people to stay with us once we had made a substantial investment in their training and also to refresh them so they would come back and give us increased production. After a man has been with us three to five years, we have quite an investment in him; so encourage him to stay with us rather than go across the street and work for our competitor, we started to give paid vacations at a time when nobody else was giving them, which gave us a more competitive position in the labor market. Our pension program is related somewhat to the same circumstances—to encourage people to stay with us. By now the halo has completely disappeared and you get the full impact of our selfishness.

But—think if you will for a moment on the by-products of our selfishness. We don't have accidents; we don't have men running around with one arm or one leg or one eye; we eliminate the suffering and pain that results from burns and other accidents. The beneficiaries under our insurance policies get the benefits of our selfishness in terms of life insurance, and little Johnny gets his

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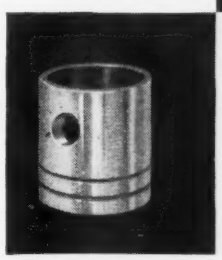

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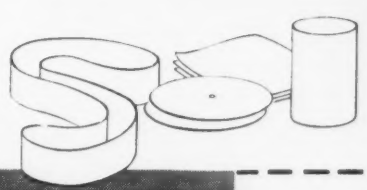

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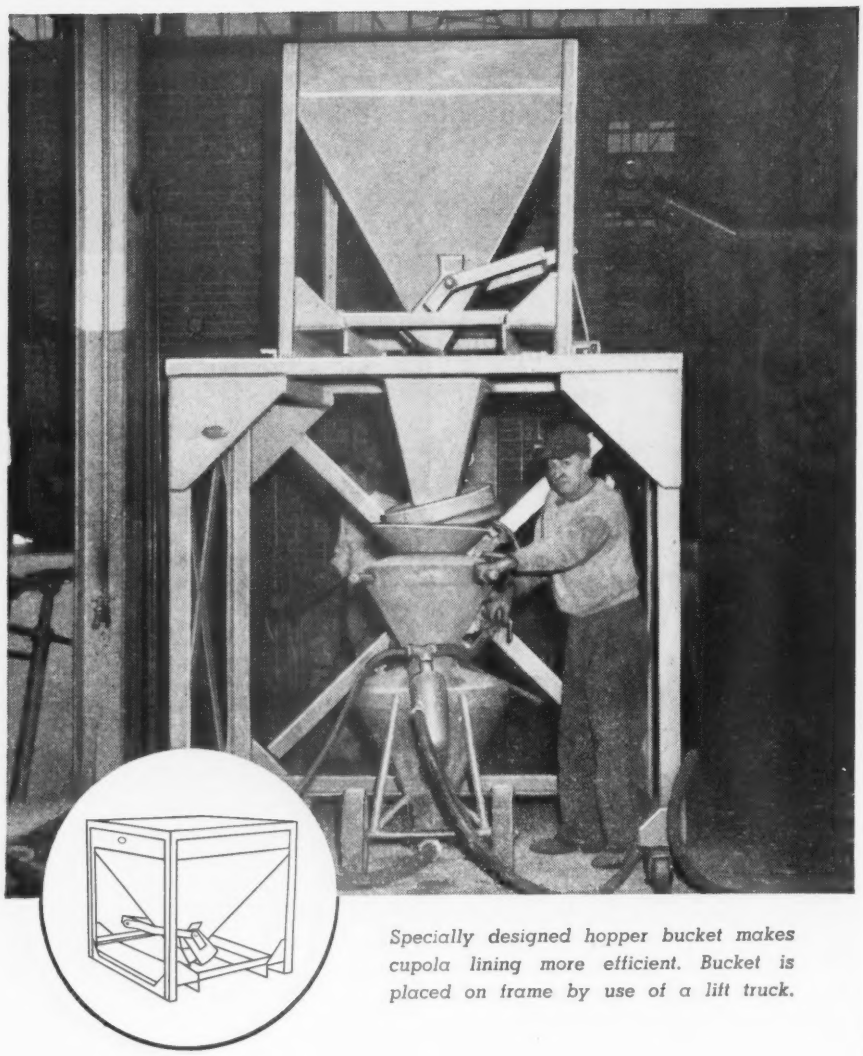

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tonsils taken out when they need it and before they have had the opportunity to stunt his mental development—all with no worry to Big Johnny. Under our retirement plan, our employees build up through their, and the company's, contributions a rather sizeable retirement income which will enable them to retire at age 65. The joys and benefits of paid vacations are also another by-product of our selfishness.

If you analyze the situation, it is this competitive selfishness which has made America grow and has made her great. Competition, as rugged as it has been, has produced not evils, but the marvelous by-products in terms of higher standards of living, better cultural developments, better schools, and everything else that we have in America in such abundance as compared with any other part of the world. Some folks suggest that competition brings out the worst in people. It seems to me our greatest concerns are the moral problems that develop with the increase of leisure—not competition.

Ford Had Profit in Mind

Think for a moment of the record of the automobile industry. Why did Mr. Ford and the automobile industry develop the very efficient low-priced transportation that has made it possible for all Americans to get to town, and to get to schools and to get to market, to travel back and forth, and produce the miles and miles of highway with a filling station, or a repair shop, or a tavern on nearly every corner? I would like to suggest that Henry Ford did not have this in mind when he developed the low-priced automobile; he developed the low-priced automobile to make a profit—and, incidentally, he did pretty well at it. But think how well the American public did as a by-product of his competitive selfishness, if you please. Free and unfettered competition in free markets is one of the secrets of America's success and when we tie those up in any kind of combinations—management, trade associations, labor, or government—we lose the very essence of the freedom that has made us great.

I read an illustration that may not be 100 per cent accurate but I think somewhat illustrates the point. When Henry Ford first started making automobiles commercially, the selling price was about $5000. At that time, the same $5000 would buy a rather good, modest, workman's home. In the intervening years, the building trades industry has been tied up with all sorts of restrictive regulations, partly through governmental codes and

controls, partly through management controls, and very substantially through closed shop labor controls and restrictions, whereas the automobile industry, except for very recent years, has been a competitively free industry operating in a free market for both labor, materials and its sales. Compare today the price of a Ford automobile with what it will purchase in terms of a house—it will hardly pay for the front steps. This illustrates the progress that can be made and the development that will result from an unrestricted freely competitive market and production. And at the same time, thinking in terms of the profits that have been made by the automobile industry, think also of the tremendous benefits or by-products that have accrued to the American people.

Climate Not the Answer

What is it that makes America great? Some have suggested that we have more natural resources, but if you study your geography closely you will find that there are many sections in the world and many countries, including Russia, who have in fact more natural resources than we have. Someone suggested the favorable climate that we enjoy but I am wondering if you ask someone who lives in Duluth in midwinter about that. No, I don't think it's the climate. Some say we work harder, but from what I have seen in the movies and heard of how the Chinese coolie works or how they load the blast furnaces in India by carrying the ore and the fuel up ramps in baskets on their shoulders, you could hardly say that the American works harder than his counterpart in other parts of the world.

No, it's something more than that. Actually our enemies do not fear our guns or even our atomic bombs. They fear more the dynamic productivity of a free people. Quoting from Senator Dirksen of Illinois—"The agility of free minds and the dexterity of free hands" are what they fear and are what contributes to America's greatness.

No, my concern is not the communists—my concern is those of us who see a temporary profit in an expedient compromise with the American Tradition of Capitalism and Free Market Competition. I'm concerned that we are not selfish enough to appreciate that so many of the social and spiritual values of freedom are the inevitable by-product of our competitive struggle for profits.

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a new nation was born and a new concept was created with the discovery of freedom—the greatest discovery in the world.

Some of my friends wonder how I can be so active in the National Association of Manufacturers and the YMCA at the same time. They suggest that the two are not compatible. I would like to suggest that freedom is a religious conception. It is not exclusively Christian; all great religions of the world have struggled for centuries to relate the individual to his Deity. No, freedom is not an economic pattern. Our capitalistic system is not the system that gave us freedom; it is a system that results from our discovery of the religious conceptions of freedom and the significance and sanctity of the individual.

Sell at a Profit

I think I can best conclude my remarks by recalling a speech I heard a few years ago by B. E. Hutchinson, the "hard-boiled," if you please, chairman of the finance committee of the Chrysler Corp. In the round-robin introduction at NAM board meetings where I first met Mr. Hutchinson, he used to introduce himself as follows: "Hutchinson, Chrysler Corporation, we sell automobiles for cash and at a profit." That pretty well summed up his philosophy. I know nothing about Mr. Hutchinson's church connections but I heard him make a speech, the title of which was "Let's Get on with the Revolution."

A good part of his introduction was a quotation of some statistics to show how much better off we were in terms of automobiles and highways and bathtubs and telephone, etc., than were the Russians and other peoples of the world. But his point was that 1950 years ago a Man came into the world and started a revolution. He said that all men are free—that neither Caesar nor the Temple can dictate to a man's conscience. He is a significant individual before his God. That revolution received new impetus when in 1776, for the first time in the history of the world, our forefathers wove into the political fabric of government their Christian philosophy of freedom. Incidentally, in the Constitution of the United States this much bandied word "democracy" does not appear, nor does it appear in the Declaration of Independence, but there is frequent reference to the Deity in both documents. Hutchinson continued by saying the revolution got new impetus in 1861 when our government said that all men were free, and then he concluded, as I would like to conclude, "Let's get on with the revolution."

Gates and Heads

(*Continued from page* 105)

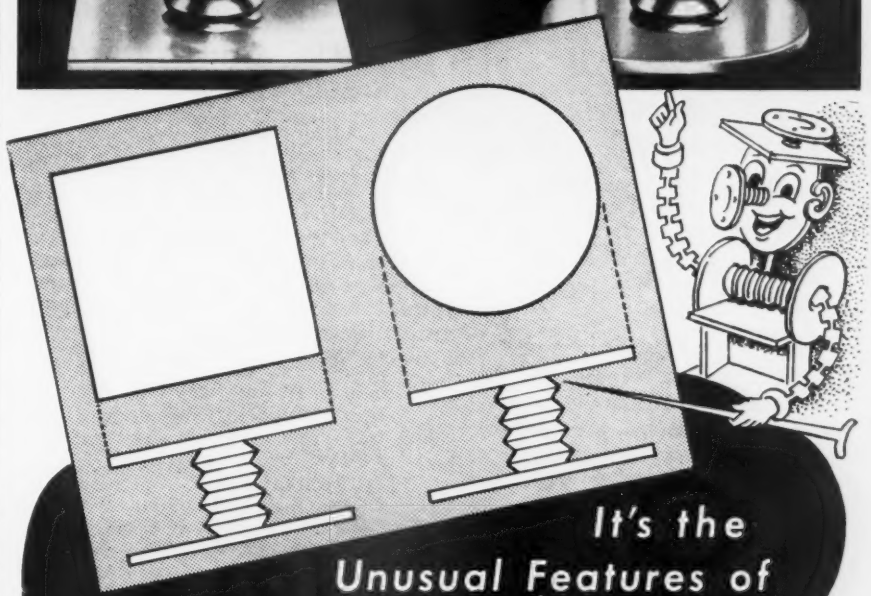
their formation in the heads.

A great many varieties of pipe eliminator are on the market, some of which contain compounds that react with each other at high temperatures with evolution of heat. Others are simply slowly oxidized, and all are ground very fine so that they prevent the radiation and conduction of heat away from the steel. Some contain high proportions of coke, graphite, charcoal or other carbonaceous material, which is absorbed by the steel and considerably increases the carbon content of the upper layers of metal. When this type of pipe eliminator is spread over the surface of steel in a shank ladle, which has cooled until it has begun to scum over, the carbon content of the surface layers is raised enough to lower their freezing point until the solidified scum on top of the steel disappears. It is hard to convince some foundrymen that this occurs, not because the temperature of the metal is increased, but because a high carbon layer is formed on the top of the steel, which has a lower melting point than the rest of the metal. The frozen layer therefore melts and vanishes. Hard spots are formed in the castings by the injudicious application of pipe eliminators of this type to the steel in shank ladles, especially when so much is used that it is carried into the molds.

Time To Add Eliminator

In general, pipe eliminators should not be put on the heads until no more steel is to be poured into them, because pouring through a layer of pipe eliminator tends to carry it down into the head, and some of it may then be found in the casting. This is partciularly true of the types that contain much carbonaceous material, which raises the carbon content of the steel it comes in contact with. Hard spots on the upper surfaces of castings often have been traced to carbonaceous pipe eliminator carried into the steel by pouring extra metal through it into half-filled heads.

When properly used, pipe eliminators are highly effective in keeping sink-heads from freezing over at the top, and therefore delay their solidification so much that their fluid contents are able to drain out of them thoroughly. These materials, however, will not re-melt the frozen upper layers of heads that have been filled from below with metal so cold that it has partially solidified before the head is entirely filled. The remedy for this condition is to see to it that the steel does not have to flow too



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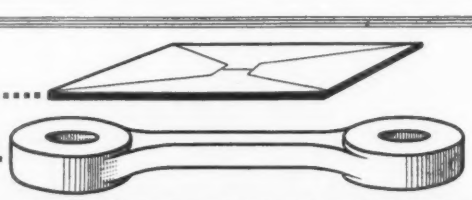

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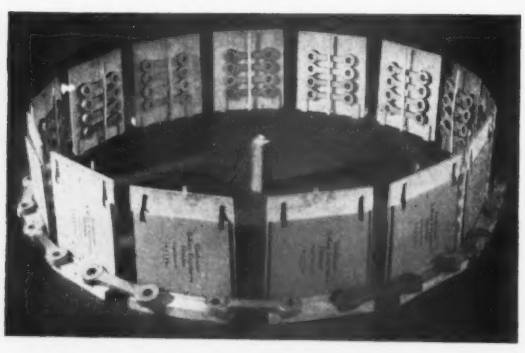

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far to reach the head, to pour the mold with hotter steel, or to fill the heads separately from the top.

Fig. 23, from Taylor & Rominski's paper, shows a casting and head of the same size and shape as those illustrated in Figs. 21 and 22, on which a proper amount of pipe eliminator was used. As the upper part of this head was kept fluid until the portions below had solidified and contracted, the shrinkage cavity is entirely at the top, and both the casting and the greater part of the head are solid. This particular head, in fact, is far larger than it need be, since its only function is to make the casting solid.

Effect of Atmospheric Pressure

When *two or more* open heads are set upon a casting, especially if they vary considerably in size, one head may freeze over completely while others are still open to the air. If this happens while there is still molten metal in the casting, the head that has frozen over tightly may hardly feed the casting below it at all, because of the influence of atmospheric pressure. As illustrated in Fig. 25, atmospheric pressure acting upon the metal in the larger, unfrozen head is exerted through the liquid metal within the casting, and forces that in the smaller closed head upward against gravity to prevent the formation of a cavity (and a vacuum) in it. The smaller head thus largely is prevented from feeding the part of the casting below it.

This condition is quite different from that in which a single head and a casting freeze solid on the outside, leaving the liquid metal within them acted upon by atmospheric pressure only to the extent made possible by the collapsing of the frozen walls. In such a closed system, there is no way atmospheric pressure can force the fluid metal upward, but the case is very different when some heads have frozen while others and the interior of the casting are still fluid, and require additional metal to compensate for shrinkage.

If all the heads freeze over completely at the same time, however, atmospheric pressure is not able to affect their feeding, any more than it does that of a single head. From the point of view of avoiding trouble from atmospheric pressure, then, it is essential that all the heads either freeze over at the same time, or that they all remain molten at the top and open to the air. Because they will feed more thoroughly if their solidification is postponed, the best thing is to have them all remain molten as long as possible, and pipe eliminator should be used on them to

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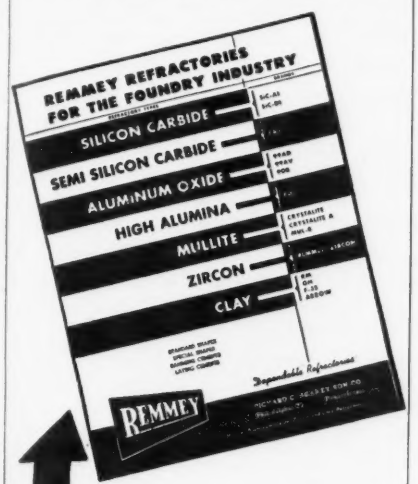

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bring about this desirable condition.

As a natural corollary to this reasoning, it follows that when a number of top-attached heads are to be set on a casting, each of them should be of such size that it will remain molten and open to the air until the metal of the casting immediately below it has solidified. If this is the case, the heads will feed to the maximum possible extent.

In addition to the mildy exothermic pipe eliminators, other materials now available are not only highly exothermic, but also produce superheated steel in any desired amounts. These materials are composed chiefly of what has long been known as thermit, but modified so as to react less violently than regular thermit powder. Thermit is a mixture of powdered aluminum and iron oxide, which react with each other when heated to high temperatures to form metallic iron and aluminum oxide (alumina). The reaction is strongly exothermic, and is started by means of a small amount of flashlight powder or similar material, which is ignited with a red-hot rod and heats the thermit around it to the temperature at which the reaction takes place. So much heat is produced by the oxidation of the aluminum that the iron and alumina are raised to a temperature exceeding 4000° F. By suitable additions to the powder, the iron may be made into steel of any desired alloy or carbon content. In most of the applications of the thermit process, the reaction is carried out in a crucible supported on a tripod, from which the hot metal is tapped through a hole in the bottom.

To Postpone Solidification

Some 45 years ago, the manufacturers of thermit experimented with the use of this material to postpone the solidification of the steel in open sink heads but, except in isolated cases, the method was not generally adopted. To set up reaction crucibles to apply thermit to a number of heads called for too much equipment to make the method attractive in steel foundry work. It was possible, to be sure, to only partly fill the heads with steel, pour the powder into the space above them, and ignite it there, but the reaction is so violent that foundrymen have generally been unwilling to use regular thermit in this way.

The new compounds, marketed under several trade names, are actually mixtures of iron oxide and aluminum, with other materials incorporated in them to slow up the reaction and somewhat reduce the temperature of the metal produced. Like regular thermit, they are so compounded that

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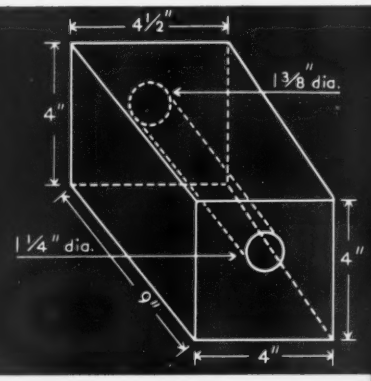

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steel of any desired composition, either alloy or plain carbon, may be secured.

In using these materials, the object sought is not simply to keep the tops of the sink heads from freezing, but actually to form a large part of the heads with the steel produced by the reaction. The mold is filled until there is a small amount of metal in the head cavities, and somewhat later, bags of the powder are tossed in on top of this steel, and the reaction starts almost immediately. The time interval between the pouring of the mold and the addition of the powder depends upon the size of the heads, being longer for larger heads. The exceedingly hot metal produced by the reaction remelts the small amount of solidified steel below it, and it is kept hot and fluid for a long time by the layer of fused, superheated alumina that floats upon it. The extremely high temperature of the metal so produced, and the fact that it can be generated when the solidification of the castings has progressed to such a point that the need for "feed metal" is at a maximum, causes a very large proportion of the added metal to enter the casting. As a result, a sound casting can be secured with a far smaller head than is required in regular practice, and the yield of good castings per ton of metal in the ladle is increased considerably.

Saving Is Debatable

Methods of figuring the saving in cost due to the reduction in the proportion of steel in the ladle that forms the sink-heads, and is cut off the castings and remelted, vary in different foundries. It seems to be a fact, however, that the saving secured by the use of these modified thermit compounds is to a certain extent offset by their cost, so that the economy of the method, in saving of metal alone, is not as great as would appear from a brief, preliminary or cursory investigation.

There is, however, a further saving, since the heads need not be as high as in regular practice, and therefore the cope or cover cores can be considerably thinner. In making molds for large castings, the resulting economy in sand and ramming time, added to that due to the saving in metal used, is sufficient to more than offset the cost of the modified thermit compounds.

In a great many cases, too, the use of these materials makes it possible to accept an order for a casting too heavy to be produced by regular methods with the available melting furnaces. Almost the entire amount of steel in the ladle can be used for

the casting itself, and the metal needed for the heads can be secured by the use of the modified thermit compounds. The maximum weight of a casting that can be made in a one-furnace plant is thus considerably increased. When there are several furnaces, it sometimes happens that in order to make some large casting, an extra furnace must be started up to produce the metal required for the sink-heads, and then shut down. When this is the case, and the casting can be made with the steel from the furnaces currently in operation, plus the metal produced by the modified thermit compounds, the cost of the latter is far less than that of starting up the extra furnace to make one, or perhaps two heats. Under these circumstances, the use of the process results in a very considerable saving of money.

Pour Hot Metal in Heads

When only mildly exothermic pipe eliminators are to be used, the importance of filling top-attached heads with fresh hot metal from the ladle can hardly be over-emphasized. In many cases this is the only way in which even partial directional solidification can be attained. When there is only one riser on a casting, it is easy to stop pouring down the gate right after the metal enters the head, move the ladle over the head and fill it with the hottest available steel. If there are a number of heads on the piece, to fill only one of them from above does not, as some foundrymen believe, introduce hot metal into the others. Instead, cool metal from the mold, under the ferrostatic pressure set up as the single head is filled, rises and enters the other ones. Sometimes tiles of large cross section can be set in the cope sand, connecting the several heads at a point a little more than half way up them, so that hot steel poured into one may flow to them all. When this is not possible, runners, preferably closed, may be carried from a central pouring basin set on top of the mold, and arranged to discharge steel into all the heads at once. With this arrangement, there is probably a little more heat loss in the flowing steel than when the heads are connected by molded-in tiles, but it may be the only way to achieve the desired result.

The time to apply pipe eliminators is after the heads have been filled with steel. When the modified thermit type of pipe eliminator is being used on very large heads, however, it is often desirable to apply ordinary pipe eliminators to retard the solidification of the heads for the desired length of time (which may be a matter of hours), and then put in the

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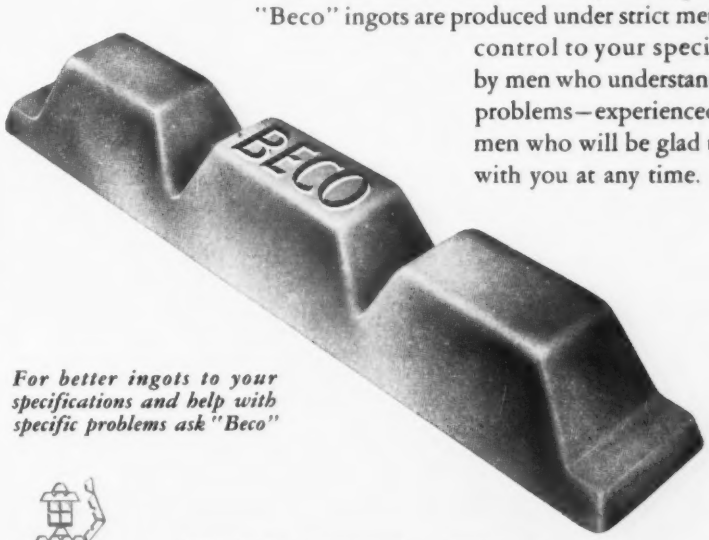

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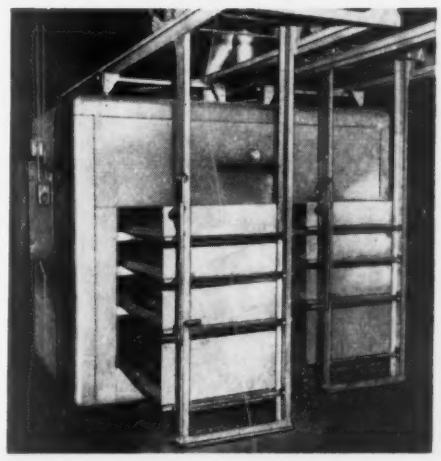

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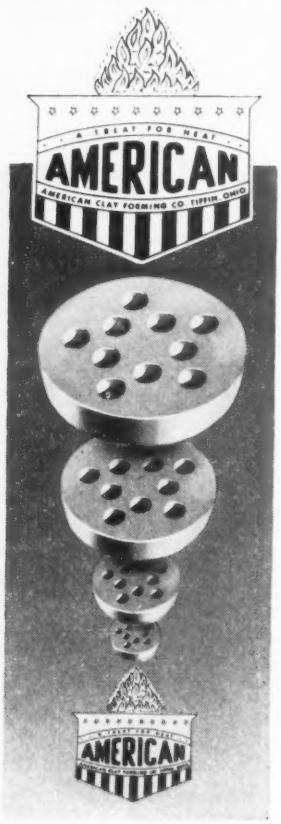

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modified thermit material. As a rule, any carbon in the ordinary pipe eliminators has been pretty well burned out by that time, and what is left of the material is stirred up by the thermit reaction and floats up with the molten alumina.

(To be continued next month)

References

14. C. W. Briggs. *Metallurgy of Steel Castings*, page 166, Fig. 42.
15. H. M. Howe and Bradley Stoughton, *Transactions*, American Institute of Mining and Metallurgical Engineers, 1907, pages 109 and 3.
16. John Howe Hall, *The Steel Foundry*, 2nd edition 1922, page 258.
17. H. F. Taylor and E. A. Rominski, *Transactions*, American Foundrymen's Society, Vol. 50, 1942, page 220, Fig. 5.
18. C. W. Briggs, *Metallurgy of Steel Castings*, page 184, Fig. 56.

100,000 Castings a Day

(Continued from page 81)

approximately every 15-20 minutes. Pouring is controlled by the operators through solenoid-operated valves which actuate the hydraulic lifting cylinders.

Furnace charges are compounded on a "prescription counter" basis, precise care being taken in the weighing and blending of charge components to obtain the exact alloy specified for any particular job. Basically, the charges consist of remelt material, pig iron, various grades of purchased material, flashings, forging scrap and alloy additions. To obtain the numerous alloy analyses specified by customers, ferrosilicon, ferrochrome, low and high carbon chrome metal, ferrotungsten, ferromolybdenum, electrolytic nickel, cobalt, tungsten metal powder, Monel shot, ferrovanadium, and graphite additions are made.

Tapping temperatures, which average about 2800° F, are controlled for each job; pouring directly from furnaces into the molds helps provide close control. Temperatures are checked with an optical pyrometer for control of the prescribed pouring temperature for each job. Hardness readings are taken and recorded on each heat before any stack from that heat is released to the shakeout. While this procedure is not intended to replace chemical analysis, it does provide a considerable degree of protection against any errors in weighing or other preparation of furnace charges since any serious errors of this type would be very likely to show up on the hardness readings.

Routine daily chemical analyses are made by an outside laboratory on the various alloys run; in addition, the company is now installing carbon control equipment and is making preparations for the installation of a complete chemical laboratory.

In the case of certain aircraft engine parts produced at the foundry in large quantities to very close metallurgical limits, a certified analysis of each heat must be furnished and each casting x-rayed. Losses under the x-ray inspection have averaged between 1 and 2 per cent on this job.

Equipment in the south foundry consists of one jolt-squeeze molding machine and one squeezer machine, a portable sand muller, a sand aerator, a small belt conveyor to carry sand to a bucket elevator which lifts it to a double hopper servicing the molding machines, and two lines of roller conveyors. The squeezer machine is another stack molding unit used for special jobs. The jolt-squeeze machine handles 12 x 16 in. and 14 x 18 in. pattern plates. Pop-off flasks are used, and the molds are jacketed before being placed on the roller conveyors for pouring. The hoist-mounted ladle mentioned previously rolls between the conveyors for pouring the molds.

This foundry produces larger castings for the same general applications as the main foundry, and also handles unusual jobs that require special gating. Molds poured here are shaken out, and the castings handled in tote boxes for transportation to the cleaning department by lift truck.

Cleaned with Malleable Shot

Castings from both foundries are cleaned with malleable iron shot in an airless blast unit equipped with a rubber tumbling belt, and having a capacity of about 200 lb of castings. Castings are dumped from the blast unit into tote boxes which have drop discharge doors. Loaded tote boxes are moved by a 2-ton fork lift truck to the inspection room where they are inspected and any necessary grinding is done on three double-wheel grinders. Remelt, which has been broken to size in the electric crusher, also is blast cleaned and stored in tote boxes until remelted. Remelt and scrap of different alloys are kept separated and the boxes well marked to prevent any mix-up when future furnace charges are made up.

An experimental section has been set up along the east wall of the building between the two production foundry sections. One of the 100-lb furnaces from the original foundry is used to provide metal. Considerable development work has already been done with nodular iron and a certain amount of commercial work of this type has already been undertaken. The company is a recently licensed producer of nodular, or ductile, iron.

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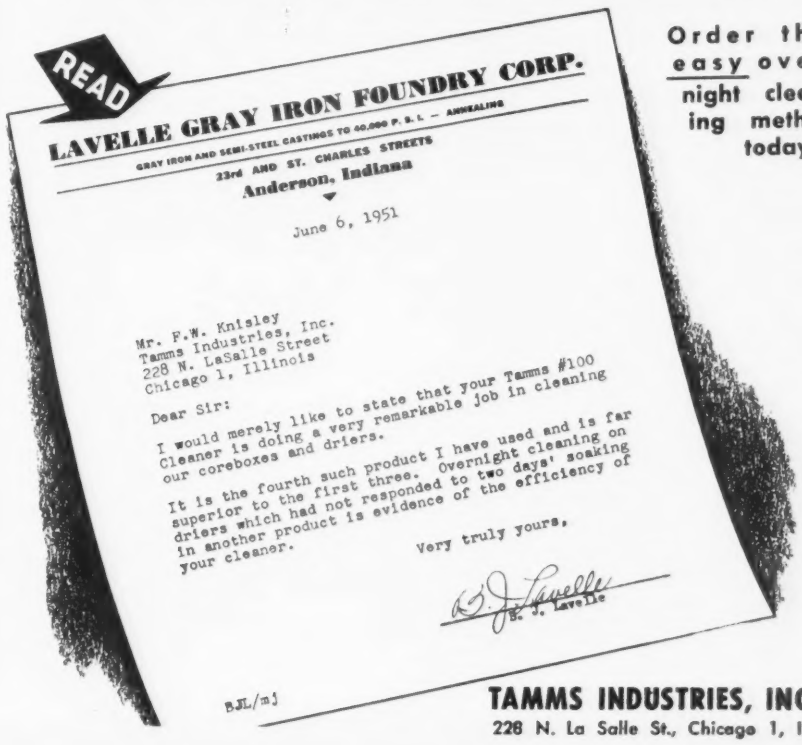
for
CORE BLOWING EQUIPMENT, METAL CORE BOXES, DRIERS AND METAL MATCH PLATES
WRITE! A trial order will convince you!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June 6, 1951

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Dear Sir:

I would merely like to state that your Tamms #100 Cleaner is doing a very remarkable job in cleaning our coreboxes and driers.

It is the fourth such product I have used and is far superior to the first three. Overnight cleaning on driers which had not responded to two days' soaking in another product is evidence of the efficiency of your cleaner.

Very truly yours,

B. J. Lavelle

BJL/mj

Order this easy overnight cleaning method today!

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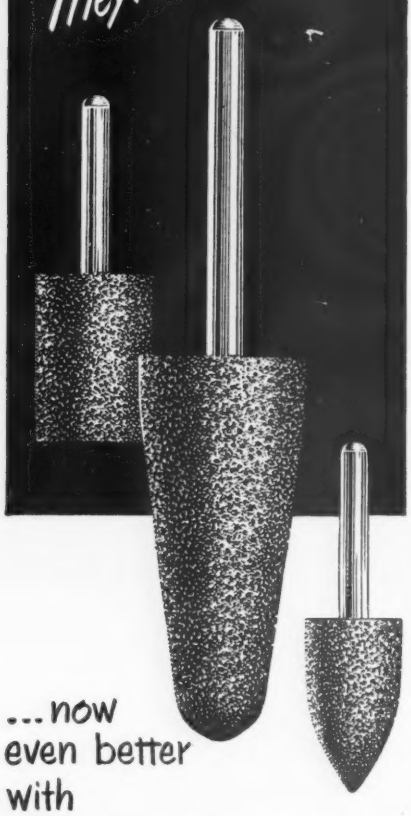
Wheels
They're the Best



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Choose Chicago Mounted Wheels—bonded with 79E Bond—and you'll never buy any other! This tough new grinding wheel bond, exclusive with Chicago Wheel, has taken the industrial world virtually by storm, doing a better grinding, burring and finishing job faster. Greatest selection of sizes and shapes for every application. Best of all, deliveries are good . . . ready when you need them. Try 79E Bond Mounted Wheels.

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OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

is also being done on several projects involving various new molding and casting techniques.

Because the plant is located on the main line of the Michigan Central Railroad between Detroit to Chicago and has its own spur track, the shipment of castings and receiving of supplies is facilitated. Sand and pig iron, for instance, are received in carload lots and trucked the short distance from spur track to storage. The plant is also served by main north and south, as well as east and west trucking routes through Marshall.

A separate sand storage building has three bins, each holding a carload of sand. A second building, measuring 25 x 80 ft, serves as a warehouse for supplies and spare equipment, and a third outbuilding fulfills the double purpose of a workshop for minor repair work on equipment and a stockroom for maintenance parts. Existence of these buildings makes storing of supplies in the main foundry building unnecessary. Consequently, the full area may be devoted to production, and maintenance of orderliness and cleanliness—good housekeeping—is simplified.

Company Provides Uniforms

Another factor which contributes to a well kept shop, greater safety and better worker morale is the fact that the company furnishes work uniforms for employees. Five uniforms are assigned to each worker; two of these are laundered every week, leaving the employee three changes for the week. Workers pay half the laundry bill, the company is paying the other half. Wearing of the uniforms is not compulsory but all the men have them and are enthusiastic over the saving in work clothes.

Strict safety rules are followed, such as wearing goggles while grinding, pouring, etc., wearing leggings while pouring, and similar rules. This has paid off in an excellent record for lost-time accident prevention all through the plant.

A fine group hospitalization and surgical insurance plan is carried by the company, providing equal benefits for all employees' dependents. Sickness and accident disability and accidental death benefits are included as well as benefits for ambulance service, x-rays, emergency first-aid, etc. One unusual feature is a straight life insurance policy which the company carries for each employee subscribing to the group insurance. Employees contribute a nominal amount monthly toward the group premium, with the company paying the principal share. While this plan is optional enrollment at present is 100%.

TESTING Foundry Sand Simplified

Combination Rammer-Compression Tester
Simple way to prepare specimens to determine compression strength.

Gordon Campbell FOUNDRY TESTING EQUIPMENT

Even with all the advantages of sand and core control for better foundry results and economies, no one likes to go through long, drawn-out sampling and testing. With Gordon-Campbell foundry testing equipment you get dependable results fast—and without a lot of fuss.

With one or more of these units any foundry sand testing program will be speeded up:

Core Hardness Tester Direct reading gives accurate hardness test in a few seconds.

Permtester A foolproof method for determining sand permeability.

Transverse Test Core Maker For preparing core specimens for transverse tests.

Transverse Core Tester Rapidly determines transverse strength of sand cores.

Baking Oven Electrically heated, dries sand samples, bakes core specimens.

Moisture Tester A reliable method of measuring moisture content.

Sand Mixer For thorough preparation of sample core-sand mixtures.

Sand Washer The easy-to-use method to determine clay content of sand.

Each of these testing units was designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

Write for full particulars.

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Metallurgical Testing Machines • Industrial Furnaces & Ovens • Temperature Control Instruments • Thermocouples & Accessories
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Although the men of Engineering Castings are more concerned with improved production and constantly higher standards of quality than with talking about their accomplishments, they do have one slogan, sincerely accepted and well attested by their spirit and pride: "Engineering Castings is a Good Place to Work!"

Metal Penetration

(*Continued from page* 101)

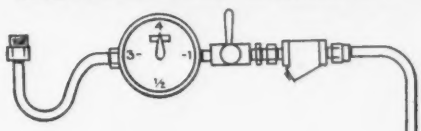
some reference is made to bronze and cast iron. Above all, he has stimulated (if you will pardon the expression) empiric thought! Being inherently selfish, I hope that Mr. Gertsman will find time and interest to devote an entire paper to iron penetration, as I'm sure he will agree that this phase is completely deserving of his attention. He will certainly not lack readers.

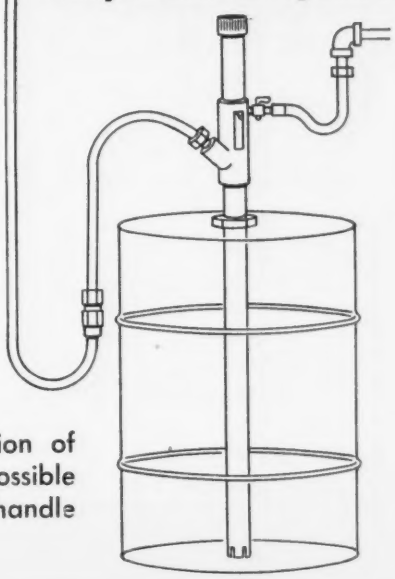
In his article, Mr. Gertsman recognizes at the outset "the complexity of the problem," as he proceeds to list briefly some of the factors that must be considered in an investigation of this character. He mentions surface tension of the molten metal—wetting characteristics—size of voids between sand grains, temperature of metal, pressure, chemical reaction, expansion characteristics, gassy metal, etc. He differentiates between burn-on and penetration. In his figure No. 9 he shows, "effect of ferrostatic pressure when gray iron was poured at 2475° F." (We seldom pour under 2550°, and usually at 2650°.) He mentions that in one test he has substituted "serpentine" for silica sand; but offers no further words of enlightenment on this phase of his test.

I also note that Mr. Dietert, in his *Modern Core Practice*, is silent regarding this mottled rock. If serpentine possesses the required properties as a mold substance, and can be economically processed, foundrymen would do well to acquaint themselves with this information; for one thing is certain, nature has bountifully provided an inexhaustible supply of this material.

Directly inspired by Mr. Gertsman's brief mention of serpentine, I headed my Austin into the mountains of California (Lake Tahoe region), where I secured a goodly sample of this "snake-bite remedy." My initial experiments with the stuff as a mold-facing were gratifying; but I would hasten to reassure my friends in the silica-sand business, that from present indications, my use of serpentine will not greatly jeopardize their annual sales.

CORE OIL DIRECT FROM DRUM TO SAND MIXER...
with the Wilkinson Pump & Meter System





Wilkinson Pump and Meter System for the handling of core oil, pays for itself within sixty days. A simple efficient installation of quality equipment designed especially to cut costs. Makes core oil additions more effective by correctly metering the specific quantity required. The oil shut off valve controls the entire system.

Simple, inexpensive, modification of this same system also makes it possible to pump the new, hard to handle emulsion type oil substitutes.

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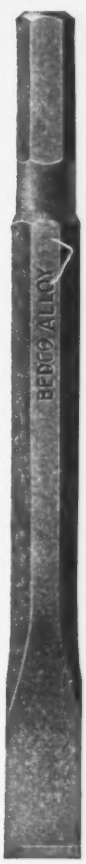

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Write for samples; make your own test.

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Dept. F

In any study of penetration into iron sands, much might be learned with regard to the effect of various low-silica grain, bentonites and clay, seacoal and other combustible elements, as well as the many other proprietary ingredients now marketed to the foundry industry.

The research now being conducted on olivine sand, at the University of Washington, Seattle, may prove of tremendous future importance to steel foundrymen on the West coast. Early reports on this material make no extravagant claims; in fact, we have implication of occasional olivine sand failure; and certainly no reason for believing that olivine will prove a panacea for all our sand ills.

The casting pictured on page 101 is a steam-turbine cylinder cover (exhaust end), and weighs slightly over 7 tons. Its average metal thickness is 1½ in. on wall sections; 4 in. on flanges, and 5 in. throughout the bearing section. The metal charge for this job was: 250 lb motor scrap, 250 lb car wheels, 200 lb pig, and 300 lb steel rail. Analysis was: 3.35 C, 1.72 Si, 0.75 Mn, 0.35 Cr. Sulphur was held to 0.12, and phosphorus to 0.20. A brinell hardness of 250 was desired; we secured 248. The tensile requirement was 30,000 psi; the bar went 39,900.

Experiment with Core Sand

The main core and drag section were molded in dry sand, a synthetic mix, bonded with fire clay, western bentonite, and pitch compound. The rest of the mold was made with sectional oil-sand cores.

In our initial experience on this job, an exceptional amount of metal penetration into cores was generally evident. At that time, our core mix consisted of 7 cu ft of Nevada silica sand, AFS No. 68, and 3 cu ft of Del Monte sand, AFS No. 48, with 50 lb of silica flour, 26 lb of corn flour and 18 pints of core oil. Oven temperature was 450° F, and we baked these cores upwards of 45 hours. In addition to extended area of penetration and burn-on in and near the bearing section, there were several ugly buckles on each of the castings made with these cores.

Guided by the experience of another job, we made a rather radical change in our core mix. The new mix read: 7 cu ft of Lapis No. 2 sand, AFS No. 41, 3 cu ft Boulder Creek sand, AFS No. 97 (containing clay and various oxides), 35 lb silica flour, 18 lb corn flour, and 14 pints of core-oil. These cores were baked at 440°F for 36 hours. All cores were given two coats of a 40 baume graphite wash.

Pyro lance!

for accurate measurement of heat of MOLTEN METALS

For quick, accurate temperature readings of molten metals, operators of non-ferrous foundries everywhere are relying on the Alnor Pyro Lance. Portable, handy to use, the Pyro Lance has a protected thermocouple, with adjustable angle head, mounted in the lance tip. It takes temperature below the surface —unaffected by dross or other conditions. Here's an easily handled instrument to help control quality in the foundry. For complete information and prices on this valuable instrument write for Bulletin No. 1724-D. Illinois Testing Laboratories, Inc., Room 511, 420 N. LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

We have made several castings from this new core mix entirely free from burn-on (pouring temperature, 2500° F), with buckle reduced almost to the vanishing point, and with "penetration" no longer a problem, despite the fact that we are using a much coarser sand. Lapis No. 2 has a base permeability of 475 (very high for this coast). The small amount of penetration still evident was immediately adjacent to the risers, which were rod-fed.

Call it luck, or control, but it is interesting to note that the last two castings made from this pattern varied in weight only 8 lb.

Our next casting from this pattern will be poured at 2600° that we may gain additional knowledge regarding burn-on—and penetration.

ASTM Creates Annual Memorial Lecture

American Society for Testing Materials, in co-operation with Battelle Memorial Institute, has established an annual H. W. Gillett Memorial Lecture in honor of Horace W. Gillett, who was the first director of Battelle and an active ASTM worker for many years.

First lecture will be delivered at ASTM's 50th anniversary meeting in New York during the week of June 23. The lecturer will be selected by an ASTM committee and will cover a subject pertaining to the development, testing, evaluation and application of metals.

Book Review

Industrial Furnaces, Vol. 1, by W. Trinks, cloth, 526 pages, 5¾ x 9 in., published by John Wiley & Sons Inc., New York. Price $10.

This fourth edition of Volume 1 brings the book up to date by incorporating the most recent scientific facts which research has discovered about heat transfer and furnace design as well as present day operating principles and techniques. All calculations and tables have been changed from gross tons to net tons, in accordance with current usage.

Arrangement of subject matter is the same as in the third edition except that infrequently used material has been moved to the appendix. The book is divided into sections on capacity, economy, thermal efficiency, strength and durability, and movement of gases in furnaces. It contains information useful to industrial furnace designers and users who want to get the most value and effectiveness out of the fuel they use.

This V-25 Electric Vibrator on hopper supplying bucket elevator keeps material flowing freely, without surges, and without periods of coming "short".

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"Pulsating Magnet"

ELECTRIC VIBRATORS

With Variable Control of Power

3600 controllable vibrations per minute keep even the most stubborn materials flowing freely thru bins, hoppers, chutes and screens . . . WITHOUT THE HAMMERING AND RODDING AND POKING THAT WASTES MANPOWER AND DAMAGES EQUIPMENT.

For 1 cu. ft. hoppers up to large storage bunkers.

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KRANE KAR cuts handling time! IT LIFTS, IT TRANSPORTS, IT SPOTS THE LOADS — loads of any shape or size up to 10 tons, using hook or magnet. Efficiently handles castings, patterns, flasks, cores, molds, ingots, scrap, sand boxes . . . and, with buckets, handles sand and clay. Rubber-tired, ***KRANE KAR*** operates indoors or outdoors. Loads and unloads trucks and freight cars. In repair operations, ***KRANE KAR*** moves foundry equipment to and from repair stations, spotting them for repair and installation. Our materials-handling expert will be glad to help you. Send for Bulletin No. 79.

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

1½, 2½, 5, AND 10 TON CAPACITIES

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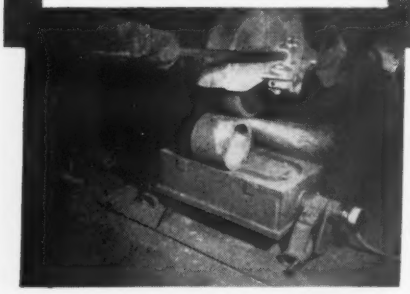

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Reduces set-up time . . .
Decreases grinding time . . .
Helps production planning . . .
Increases grinding wheel life

Steel and iron castings of any shape or weight are held securely in position under a swing grinder with Dings Hold-Tite Magnet—eliminating need for blocking, wedging or clamping. Firm hold on piece increases wheel life. Over-all grinding time is reduced 25% or more—with benefits of lower unit labor costs and less operator fatigue. Also makes possible better production planning because grinding times become more standard. Magnet has easily renewable wearing plate. Available with or without trunnions which allow tilting to seven positions by foot lever. Available for 115 or 230 volts D.C. with hand or foot switch. Built in two sizes: magnet face 16" x 29½" or 16" x 16" Write for full details.

Other Features:

- Wound for continuous duty with glass-insulated wire. Long life.
- Low operating cost—only 290 watts for small size—475 watts for large size.
- Simple and sturdy construction . . . easily installed . . . negligible maintenance cost.
- Extra strong magnetic holding power.

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"Separation Headquarters Since 1899"

Dings
"HIGH INTENSITY"

...TRADE PUBLICATIONS...

For More Details on these Items Use Reply Card—Page 209

FOUNDRY EQUIPMENT: Sterling Wheelbarrow Co., 7036 West Walker St., Milwaukee 14—Catalog 64 describes and illustrates the company's complete line of foundry flasks, bars, clamps, pins and bushings, core plates, bottom boards, bands, upsets, wheelbarrows, core trucks, casting carts, slag buggies, and similar equipment. Branch offices and district managers are listed.
For More Details Circle No. 90—Page 209

FLOORING: Flash-Stone Co., 30 East Rittenhouse St., Philadelphia 44—Illustrated catalog points out why installation of engineered industrial floors requires experienced planning, skilled technical execution, and exacting cost control. It describes how floors can be engineered to withstand moving and deadweight loads, shock and vibration, extremes of temperature, oils, greases, and other destructive agents.
For More Details Circle No. 91—Page 209

GRINDING WHEEL BOND: Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago 7—Form 2035 describes vitrified bond especially made for grinding carbide cutting tools. Bulletin gives details on applications and advantages of using bonded wheels for tungsten carbide tool grinding, with specifications of straight and cup wheel sizes for rough and finish grinding.
For More Details Circle No. 92—Page 209

REFRACTORIES: Chas. Taylor Sons Co., 710 Burns St., Cincinnati 14—Bulletin 315 discusses properties and applications of ramming mixes and patches for industrial furnaces, with instructions for application. Diagrams illustrate use of the materials in blast furnaces, furnace roofs, tunnels, and burner blocks. Selection of materials, based on service requirements, is explained.
For More Details Circle No. 93—Page 209

MOLDING MACHINES: SPO Inc., 6449 Grand Division Ave., Cleveland 25—Catalog 2000 contains information and specifications on the company's line of jolt-squeeze-strip molding machines, featuring semiautomatic pushbutton control of all operations and having jolt capacities ranging from 1500 to 4000 lb.
For More Details Circle No. 94—Page 209

METALLOGRAPH: Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.—Catalog E-232 demonstrates advantages of a new metallograph with projection screen for determining crystalline structure, composition, grain-size and non-metallic inclusion content of metals. Four types of illumination assure comprehensive analysis of even the most difficult specimens: bright field, dark field, polarized light and phase contrast. Specifications and price list are included.
For More Details Circle No. 95—Page 209

MEEHANITE: Meehanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y.—Bulletin 34 commemorates the 25th anniversary of the company and provides a number of case histories of unusual applications of Meehanite castings in various industries.
For More Details Circle No. 96—Page 209

WELDING: International Nickel Co., 67 Wall St., New York 5—Technical bulletin T-33 deals with resistance welding of nickel and high-nickel alloys. It contains tables on mechanical properties, chemical compositions, recommended conditions for welding and other information.
For More Details Circle No. 97—Page 209

BLAST CLEANING: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind.—Bulletin 794 describes application of airless abrasive blasting to cleaning problems in industries concerned with ordnance material production. Shot peening also is covered.
For More Details Circle No. 98—Page 209

NI-AL BRONZE: R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23—Vol. 7, No. 3 of the company's house organ, "Lavingot," features an article on nickel aluminum bronze, listing properties, foundry practice, heat treatment and applications of the metal in cast form.
For More Details Circle No. 99—Page 209

BELT CARRIERS: Stephens-Adamson Mfg. Co., 100 Ridgeway Ave., Aurora, Ill.—Bulletin 2-C illustrates, describes, and provides specification tables on the various models in the company's line of carriers for conveyor belts.
For More Details Circle No. 100—Page 209

CYLINDERS: Miller Motor Co., 2040 North Hawthorne Ave., Melrose Park, Ill.—Bulletin A-105 on air cylinders and bulletin H-104, covering hydraulic cylinders, contain complete specifications, mounting and engineering data on the respective equipment.
For More Details Circle No. 101—Page 209

LUBRICANT: Acheson Colloids Corp., Port Huron, Mich.—Bulletin gives details on uses and advantages of colloidal graphite in lubrication of diecasting machines.
For More Details Circle No. 102—Page 209

VALVES: Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y.—Catalog 704-A deals with valves for controlling the flow of oil to industrial oil burners. A table of valve capacities is included.
For More Details Circle No. 103—Page 209

Accumet Precision Castings

for all industrial uses

With Accumet Precision Castings, Crucible has developed a process of producing precision investment castings in intricate designs with the smooth, satiny finish and closely-held dimensions characteristic of "lost wax" castings. Casting tolerances start at plus or minus 0.005" although under certain circumstances closer tolerances can be held. This relatively new metal forming process solves many difficult problems in design, tooling and production of metal components.

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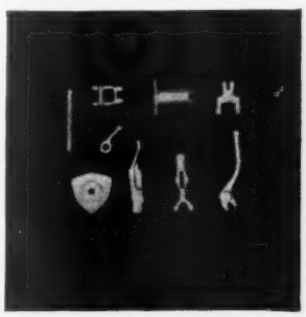

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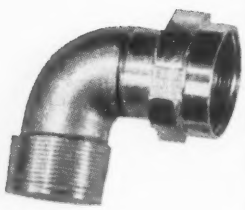

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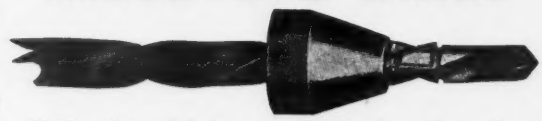

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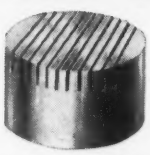

DEEP HEAD
Wide or Narrow Slots
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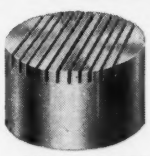

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DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS

because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

IF YOUR PROBLEM INCLUDES

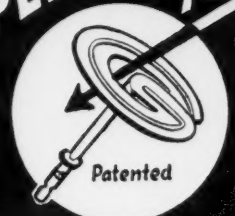
chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

THE MASTER PNEUMATIC TOOL COMPANY, INC.

ORWELL, OHIO • U. S. A.

SALES • SERVICE • STOCK • COAST TO COAST

OPEN HEAD *Radiator Chaplet*



reduces casting rejects.

HOLDS CORES BETTER BECAUSE SAND PACKS SOUNDER UNDER HEAD AND AROUND THE STEM

Patented Open Head design and time-proven quality make Cleveland Open Head Shoulder Radiator Chaplets an important contribution to improved castings and better deliveries.

Write for Bulletin showing the extensive line of Cleveland Chaplets.

We also make MOTOR CHAPLETS

BOILER CHAPLETS, FORGED HEAD CHAPLETS, FITTED HEAD CHAPLETS, DOUBLE HEAD CHAPLETS and other types.

CLEVELAND CHAPLET & MFG. CO.
26470 Lakeland Blvd., Euclid, Ohio
P. O. Box 5877, Cleveland, Ohio

CLEVELAND *Chaplets*
Since 1890

***New* CANNON "QUIET-TYPE" DOUBLES VIBRATOR LIFE**

Greater Vibration
Noiseless Operation
Minimum Maintenance
Longer Life

Cannon 2" Style EM "Quiet-Type", Heavy Duty Vibrator with long stroke.

● Air-cushioned impact and heavier pistons with longer strokes give Cannon "Quiet-Type" Vibrators long-lived, economical vibration. There is no metal to metal pounding. Bolt and end plate breakage are eliminated.

In recent tests a Cannon "Quiet-Type" Vibrator operated continuously for 3600 hours with no decrease in efficiency . . . no indication of structural failure.

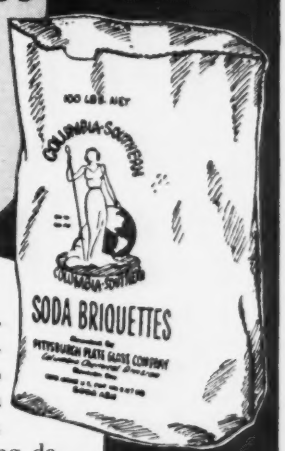
For better, more dependable pneumatic vibration, try Cannon Vibrators. Available in 1¼" to 4" piston sizes, they range in weight from 9 to 140 lbs. Satisfactory performance is *guaranteed.* Send for complete information today!

A-4501

CANNON VIBRATOR COMPANY
1111 POWER AVE., CLEVELAND 14, OHIO

Desulphurizing Economy . . . *packed in a bag!*

Columbia-Southern Soda Briquettes



Savings all along the line result when you put Columbia-Southern Soda Briquettes to your test. Not only will you economize in *time* and *labor,* but you will get outstanding desulphurizing action and efficient physical cleansing of iron.

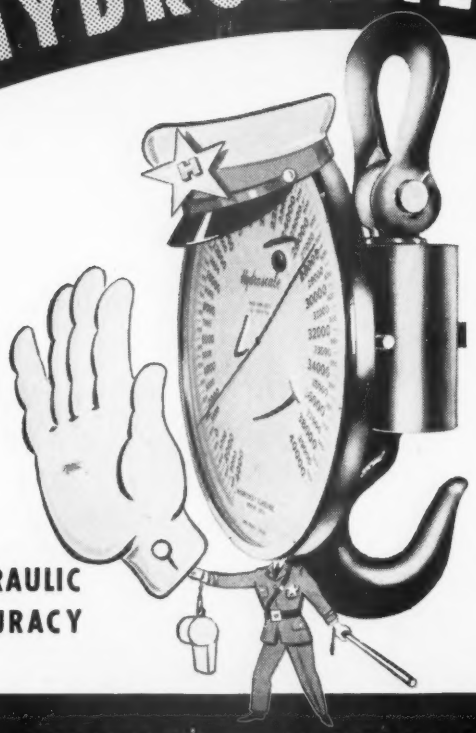
Walnut in shape and size, Columbia-Southern Soda Briquettes expose maximum surface area for faster, more dependable performance.

Pellet form safeguards against the costly waste of dusting losses; Columbia-Southern Soda Briquettes are easy to work with.

Columbia-Southern Soda Briquettes are supplied in handy 100-lb. paper bags for ease in moving and storage.

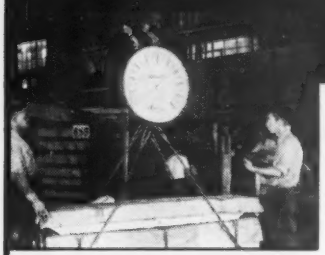
COLUMBIA-SOUTHERN
CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
FIFTH AT BELLEFIELD, PITTSBURGH 13, PA.

HYDROSCALE



HYDRAULIC ACCURACY

A RUGGED—COMPACT CRANE SCALE THAT PROTECTS YOU AGAINST LOSS!



● **IN RECEIVING**
Check incoming weights at the dock without delay and extra handling

● **IN INVENTORY**
Avoid transporting heavy bulky material to weighing stations. Speed up the job.

● **IN PRODUCTION**
Prevent overloading equipment. Batch and measure accurately. Foundries load ladles with even mold pours.

● **IN INSPECTION**
Scale can be incorporated in tension and load-pulling test equipment.

● **IN SHIPPING**
Check parts going out for sub contract work and final shipping weights.

No tie-up of men and equipment common to central weighing station layout. Weighs instantly as you lift the load to move it! Models 500 to 100,000 lbs. Dials 12", 24" and 30". Kilogram dials and other special designs for special work . . . Write for catalog.

HYDROWAY SCALES, INC.

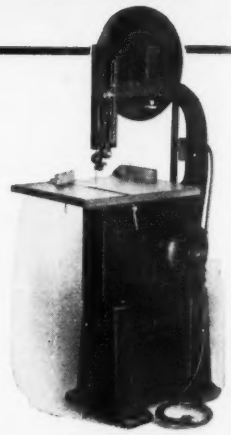
20630 W.8 Mile Rd., P.O. Box 4754, Detroit 19, Mich.

"OLIVER" METAL CUTTING 18-INCH BAND SAW

Has high speed motor for cutting wood, plastics and sheet metals . . .

Or with variable low speed motor for cutting heavy cross sections

On work within its capacity this "Oliver" 18-inch Band Saw is unmatched. Cuts true, steady, smooth. Has variable low speed geared head direct connected to lower wheel for cutting light and heavy cross sections of metal. Also furnished with high speed motor for cutting wood, plastics, compositions, sheet metals. Has many features of the larger "Oliver" Band Saws. Write for Bulletin No. 192-M.



"Oliver" also makes Metal Cutting Band Saws in 30", 36", 38" sizes. Ask for details.

OLIVER MACHINERY COMPANY

Established 1890 **GRAND RAPIDS 2, MICHIGAN**

HAUCK OIL AND GAS BURNING EQUIPMENT

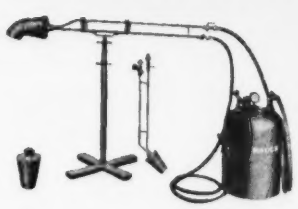
for CUPOLA LIGHTING
MOLD DRYING
LADLE HEATING
CORE BAKING
FURNACE HEATING

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

Featuring
3 BIG OPERATIONS WITH 1 EQUIPMENT



This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

HAUCK MANUFACTURING CO.
106 Tenth St., Brooklyn 15, N. Y.

Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

AMASTEEL.....!

For low cost cleaning

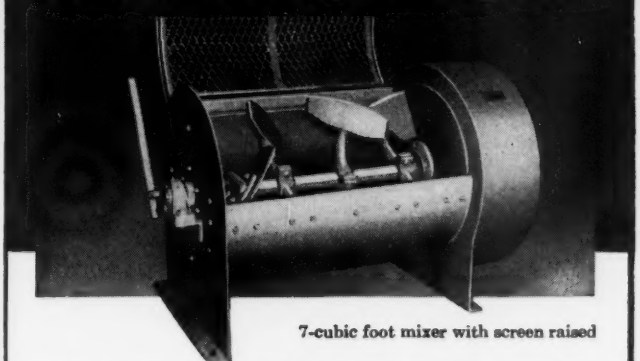
- AMASTEEL is the blast cleaning material that is engineered for the job.
- AMASTEEL assures the lowest cleaning cost.
- AMASTEEL lasts many times longer. Investigate!
- AMASTEEL provides peak efficiency in shot for blast cleaning and peening. Developed by the maker of "PEENBLAST", "CLEANBLAST" and "ALLOY 99".

Abrasive for any and all kinds of work.

PRODUCERS OF
PEENBLAST
CLEANBLAST
ALLOY 99

ALLOY METAL ABRASIVE CO.
311 WEST HURON ST. ANN ARBOR, MICH.

FASTER, BETTER MIXING
Lowers Your Operating Cost



7-cubic foot mixer with screen raised

Mix core and molding sands, and cupola patch mixes with MULTI-BLADE MIXERS

- THEY'RE FAST . . . mix and discharge a load in four and a half minutes.
- THEY MIX BETTER . . . the best blade arrangement in any mixer . . . cuts, turns and kneads the mix ten times with every shaft revolution.
- THEY'RE QUALITY BUILT . . . trouble free, self-contained, have anti-friction bearings, direct drive (no clutch or belts), and come in sizes from 3 to 60 cu. ft. capacities. Special and larger mixers also available.

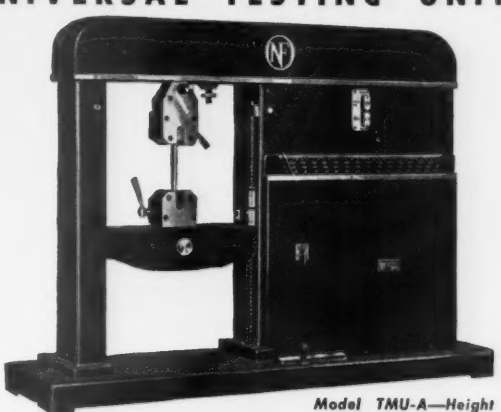
Get these advantages and resultant savings. See your foundry equipment dealer or write direct to

MULTIPLEX MACHINERY CORP. ELMORE OHIO

It Will Pay to Make Your Own Tests with

NATIONAL FORGE

UNIVERSAL TESTING UNITS



Model TMU-A—Height 44"; width 64"; weight 1200 lbs.

The National Forge Universal Testing Machines, are compact, accurate, dependable, easy to operate and moderately-priced.

Wide working clearances, long stroke, quick-action simplified variable-speed control, improved grips and a wide spread of load scale ranges adapt this modern, streamlined unit to production, research or school instruction tests of a great variety of materials and specimen sizes. A.S.T.M. accuracy requirements are guaranteed.

Three load scale ranges: Model TMU-A—0-30,000, 0-6000, 0-600 lbs. Model TMU-B—0-15,000, 0-3000, 0-300 lbs.

Prompt deliveries of few units remaining in stock. For details, write for Brochure 501.

TESTING MACHINE DIVISION

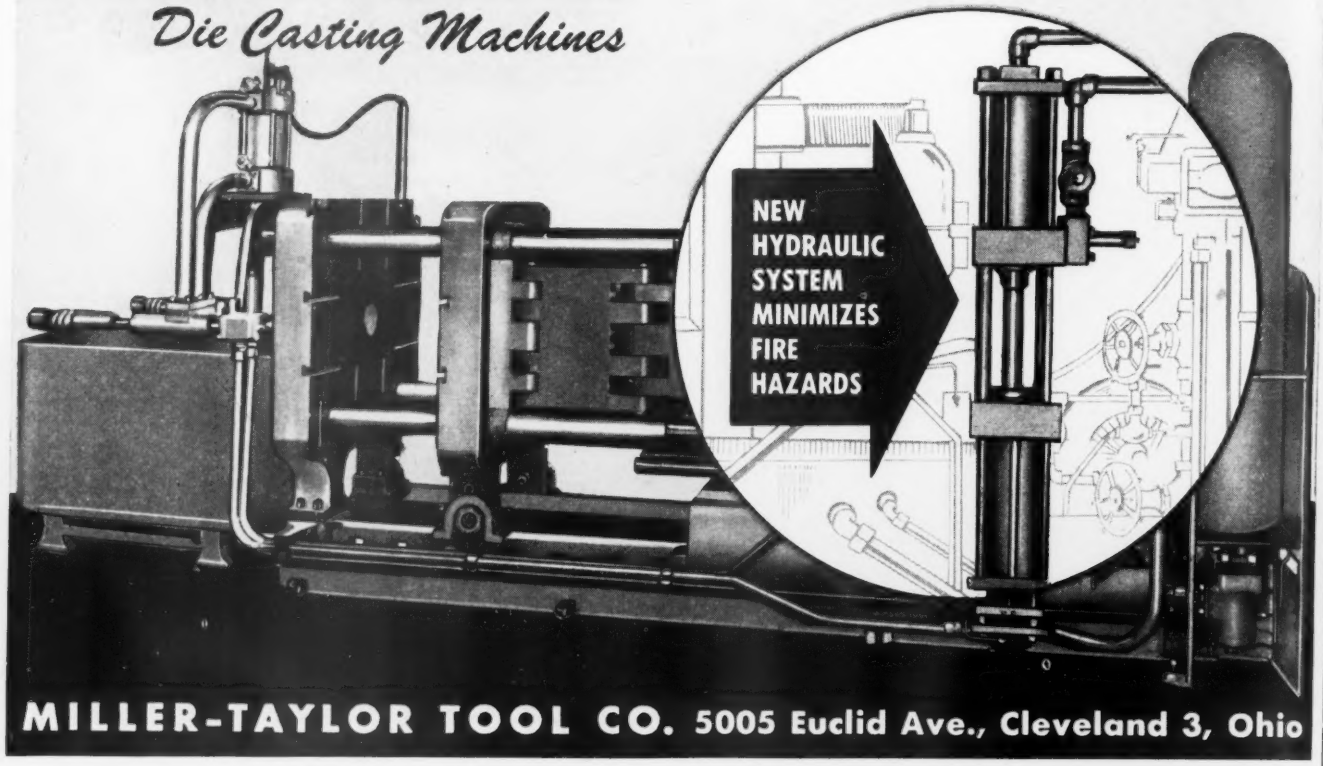
NATIONAL FORGE & ORDNANCE COMPANY

Dept. F, Irvine, Warren County, Penna.

Unsurpassed for Speed, Safety and Trouble-Free Service!

CAST - MASTER

Die Casting Machines



MILLER-TAYLOR TOOL CO. 5005 Euclid Ave., Cleveland 3, Ohio

Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3, and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 16-page article on the use of TELLURIUM in chill control.

American Smelting and Refining Company

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4501 Richmond St.

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Producers of

FOUNDRY • METALLURGICAL

INDUSTRIAL COKE

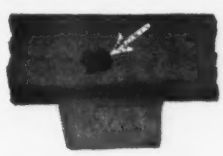
SAVE MONEY
ON BLAST CLEANING

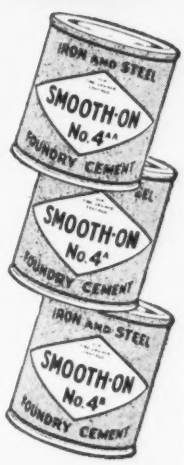
GET
AMERICAN SHOT & GRIT

American's own manufacturing process assures uniform hardness and size. All sizes are graded to S. A. E. specifications and packed in 100-pound bags.

THE AMERICAN STEEL ABRASIVES CO.
GALION, OHIO
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

3 Shades
FOR A CLOSE MATCH with YOUR castings





When you true up surface blemishes in castings with Smooth-On No. 4 Foundry Cement, you can make a close match in color and texture. For light colored, fine grained castings use Smooth-On No. 4AA, which will also take a machined finish. For medium gray metal choose No. 4A. For dark gray, coarser grained pieces you'll find Smooth-On No. 4B a match. Experienced foundrymen use Smooth-On Foundry Cements regularly to fill in harmless but disfiguring sand and blow holes, pock-marks, porous spots and small dents. If your supply house hasn't Smooth-On No. 4 Foundry Cements, write us.

FREE Sample and Handbook

Write for free trial sample—specifying shade you wish to try. We'll send also the famous 40-page Smooth-On Handbook of time-saving, money-saving repairs made with various Smooth-On Iron Cements. Send NOW.

SMOOTH-ON MFG. CO., Dept. M.
570 Communipaw Ave., Jersey City 4, N. J.

Do it with **SMOOTH-ON**
FOUNDRY CEMENT

Where Production is the first Consideration, Pressure Cast Aluminum Matchplates and Cope and Drag Plates are the only Satisfactory Answer

Only one master pattern does it! From it we make you single or multiple pattern matchplates, casting them under pressure in plaster molds. Why not find out exactly how much we can save you by this method, or by furnishing cope and drag plates which likewise jump production and lower your costs?

Get our quotations today.

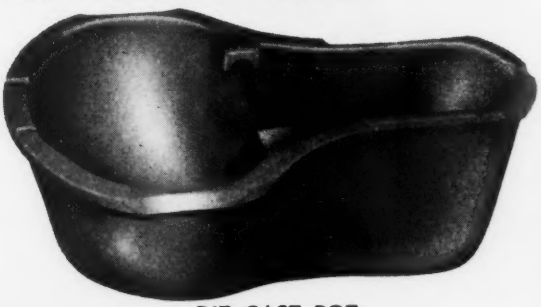
TOLEDO MATCHPLATE COMPANY
534 State Street Toledo 2, Ohio
AFFILIATE: PLASTER PROCESS CASTINGS CO.
6922 Carnegie Ave., Cleveland 3, Ohio

Pressure-Cast MATCHPLATES
COPE and DRAG PLATES

MELTING POTS—Ingot Molds

FOR NONFERROUS METALS FROM ACME SPECIAL FORMULA

SPOUT POT
NO. 550A



DIE CAST POT

HOLDING BOWL
NO. HP7001

WRITE FOR
SCHEDULE OF 40 SIZES

ACME FOUNDRY COMPANY

2502 22nd Street **DETROIT 16, MICH.** *Phone:* Tashmoo 5-2404

A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

HIGH SILICON IRON JISCO

A "blend" with JISCO is sound metallurgy.

THE JACKSON IRON & STEEL *Company*
JACKSON, OHIO

COST CONTROL WESTOVER ENGINEERS

Westover ENGINEERS
FOUNDRY MANAGEMENT CONSULTANTS
3110 WEST FOND DU LAC AVE., MILWAUKEE 10, WIS.
There is no better time than NOW to review incentives, methods, scheduling, production control and paperwork processes.

BASSETT ROTARY FILE & SAW CO.

Manufacturers of Rotary Files and Regrinding Service
548 N. Cicero Ave., Chicago 44, Ill.
Phone—Columbus 1-1770
New Tools made to your specifications. 48 hr. service on regrind work.

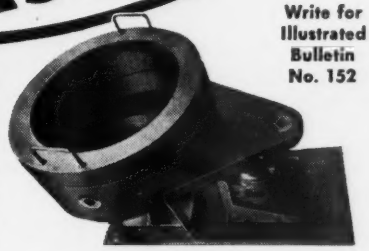
SHORT CUT TO PROFITS

WELDED AND BOLTED TYPES • ALL SIZES • COMPLETE CONTROL EQUIPMENT • 26 YEARS A LEADER IN MAGNETIC MATERIALS HANDLING.

THE OHIO ELECTRIC MFG. CO. • 5900 MAURICE AVE. • CLEVELAND, O.
Associate Member Institute of Scrap Iron and Steel, Inc. A-2767

Ideal for EXPERIMENTAL CENTRIFUGAL CASTING

Write for Illustrated Bulletin No. 152

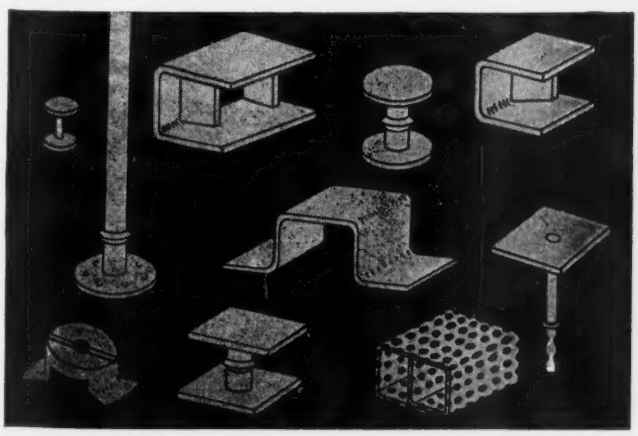


MODEL J is well suited for experimental work in Aluminum, Iron, Steel and Bronze as well as regular production. Casts bearings, bushings, gears, etc. Accommodates interchangeably both permanent molds or sand molds up to 24" in diameter and up to 12" high.

MODEL J is versatile, sturdy and easy to operate to produce economically a wide range of superior castings. It is completely integrated on a single base, readily moved as a unit, and does not require a special foundation.

Centrifugal Casting Machine Co.
P. O. Box 947
Tulsa 1, Okla.

There's always one Chaplet that's best for each job
ARE YOU SURE YOU'RE USING IT?



The large variety of "Buffalo" Chaplet designs enables you to meet your needs *exactly*. Given this broad selection, you are always assured of greater strength, easier burning-in and higher resistance to chilling for each specific job.

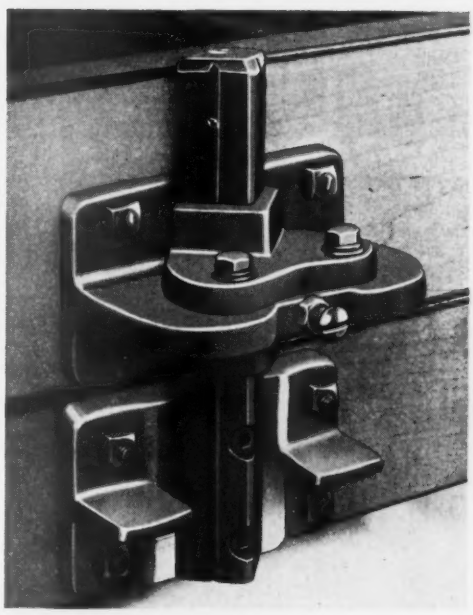
CATALOG NO. 15 offers complete details on designs, sizes and gauges. Copies mailed promptly. Samples of any "Buffalo" Chaplet will be gladly furnished.

Combined SUPPLY & EQUIPMENT CO., INC.
211 CHANDLER ST., BUFFALO 7, N. Y.

V-G CHERRY SNAP FLASKS

Now Furnished with the NEW V-G WIDE "V" PIN ASSEMBLY

INTERCHANGEABLE WITH ALL WIDE "V" PLATE GUIDES



SPECIAL FEATURES:

A really rigid, accurately machined pin. **Will not bend.** Pin easily replaced when worn, or when a longer or shorter pin is desired.

Easy **PERMANENT** adjustment of **longer** cope slide.

Cast aluminum pin base and cope ear—machined for perfect alignment. Full length and width bearing against flask.

Available for straight or tapered flasks.

V-G Flasks are seasoned cherry with new hook-type latches that never loosen. Adjustable hinges are screwed AND bolted to the flask. Wear strips of either steel or HARDENED-24ST-Aluminum are available. The V-G round pin assembly and other standard pins are also offered.

ELIMINATE COPE SHIFTS WITH V-G FLASKS
ACCURATE • DEPENDABLE • RUGGED
Shipments can be made promptly
Write for complete information
Correspondence invited from Distributors

V-G FLASK & FITTING CO.
MADISON, CONNECTICUT

Heroult

ELECTRIC MELTING FURNACE

. . . as ever, the dependable furnace for the production of high-grade stainless, alloy and rimming steels.

Removable roof of new design now available for the larger furnaces.

AMERICAN BRIDGE COMPANY
General Offices: Frick Building, Pittsburgh, Pa.

Contracting Offices in New York, Philadelphia, Chicago, San Francisco and other principal cities
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AMERICAN BRIDGE

UNITED STATES STEEL

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EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

ENGINEERS

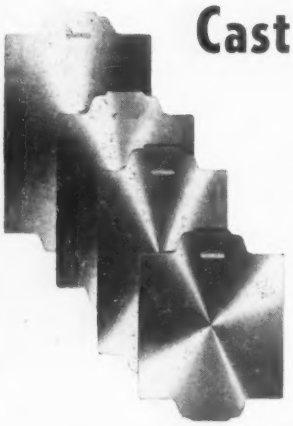
CLEANING STARS

A special metal has been developed for this star to guarantee a lower cleaning cost because of its resistance to abrasion.

Foundrymen using these stars say they outlast all other stars they have previously used.

Cut your cleaning costs by ordering a trial lot now

QUINCY FOUNDRY INC.
★ QUINCY, OHIO ★



Cast Aluminum MACHINED PATTERN PLATES

Shipped promptly from the World's Largest Stock

All standard flask sizes are carried in stock. All plates are cast with one inch flask margin all around PLUS large, well shaped ears for flask pins and vibrator. Order by flask size, not plate size. It will pay you to investigate this source for quality plates

Some Typical Prices for ⅜" Plates . . . Add 33 1/3% For ½"

10 x 16 . . 9.90	11 x 18 . . . 11.22	12 x 18 . . . 11.88	14 x 16 . . . 12.18
10 x 18 . . 10.56	12 x 14 . . . 10.26	13 x 16 . . . 11.58	14 x 18 . . . 14.52
11 x 16 . . 10.26	12 x 16 . . . 10.86	14 x 14 . . . 11.22	16 x 16 . . . 14.52

Send for Price List Today—Special Shapes and Thicknesses to Order

ARTHUR E. WILL, 643 West 11th Street, **ERIE, PA.**

No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

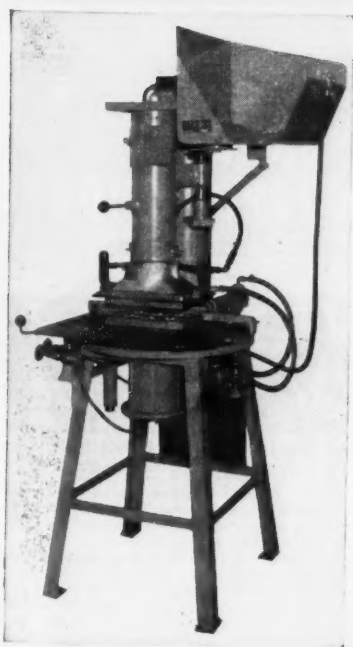
Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

AUTOMATIC • HEAVY DUTY •COR-BLO•



HIGH DRAW MODEL "C-H-E"

Cores up to 15 lbs.

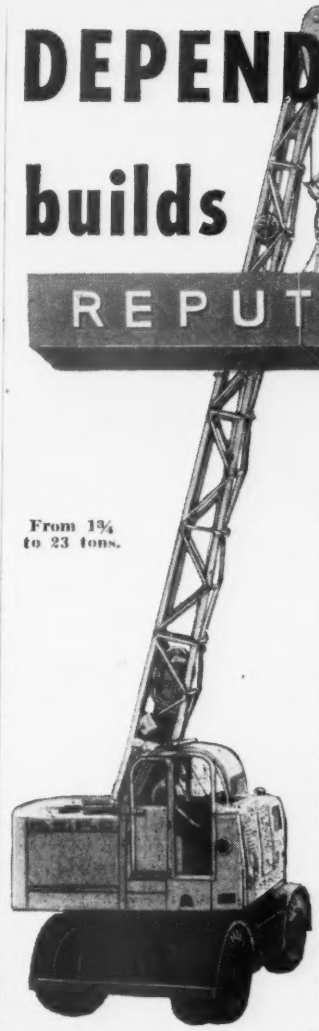
With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

•

Let us figure on your requirements.

HARRISON MACHINE COMPANY
Wesleyville, Erie, Pa.

DEPENDABILITY builds REPUTATION



From 1¾ to 23 tons.

• In about every country of the world, the performance of COLES CRANES is so consistently excellent that the name *COLES* has become synonymous with trouble-free operation whereever mobile cranes are used.

BACKGROUND FOR DEPENDABILITY

• Over three-quarters of a century's experience in the manufacture of mobile cranes and with about 15,000 COLES Cranes in operation all over the world — have guided our engineers in building COLES CRANES to meet every requirement necessary to cope with heavy material handling. Operators have learned to depend upon the outstanding performance, safety and economy from the many salient features incorporated in every Coles Crane. RESULT: — re-orders of two or more cranes from the following firms:—

ATCHISON, TOPEKA & SANTA FE R.R.
BOEING AIRPLANE COMPANY
F. S. BRIDGES, Ltd.
BUTLER MFG. CO.
CANADIAN NATIONAL RAILWAYS
GENERAL MOTORS CORPORATION
HUMBLE OIL & REFINING CO.
HYDRO ELECTRIC POWER COMMISSION of Ontario
IMPERIAL OIL COMPANY, Ltd.
A. O. SMITH CORPORATION

• There must obviously, be a good reason for this expression of confidence and we invite your investigation or inquiry.

• *Ask for the name of your nearest COLES dealer or complete facts and specifications.*

COLES CRANES INCORPORATED

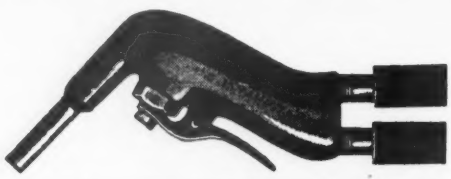
THE NAME THAT CARRIES WEIGHT IN MATERIAL HANDLING

P.O. Box 942, Dept. B
JOLIET, ILL.

THIS IS THE GIMMICK THAT ELIMINATED SWABS, BRUSHES AND SPRAY CANS FROM HUNDREDS OF FOUNDRIES. IT IS THE

MURPHY PISTOL SPRAYER

Over a million sold to date. Is the most compactly and scientifically designed ejector ever made for blackening purposes. It is invaluable for the cleaning of permanent molds for aluminum and other metals by sand blasting. Indispensable in up-to-date shops. Designed by a practical foundryman. Well made and guaranteed.



PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

Used for Silica wash, oil, water or any liquid material. For sand-blast cleaning. As a blow gun for cleaning motors and machinery. If your dealer cannot supply you at once, order direct from manufacturer below. Literature on request.

HAMILTON SPRAY GUN

Complete with 4½ ft. suction hose and sinker . . . $10.00 F.O.B. Hamilton, O. *For spraying molds and cores with any liquid. For cleaning motors and machinery. For laying dust. Trigger control. Well made and guaranteed.*

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

HAYNES EQUIPMENT

JOLT SQUEEZER

This portable jolt squeezer is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder. Jolt tables 17" x 20" and 19" x 22".

The post and squeeze cylinder are cast in one piece. Top of post machined to take 2-7/16" cold rolled shaft for the swing arm. Zerk fittings throughout.

No bolts or screws in this machine!

FULLY EQUIPPED

Equipped with air gauge, pop-off gauge and pin for gate horn.

The price will interest you!

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST., KALAMAZOO, MICH.

LADLES—BRASS FURNACES—CORE OVENS

MONK

MOLDERS' TOOLS
THE MONK TOOL CO.
UNION ST., GENEVA, ILL.

PRODUCERS CORE SAND CORPORATION

PITS AT MICHIGAN CITY, INDIANA AND SAWYER, MICHIGAN

MICHIGAN CITY, INDIANA

WELLMAN

Williams Type

NO BUCKET-OPENING SHOCK ON CRANE HOOKS

The Wellman "Hook-on" single-line bucket provides you with clamshell bucket service at any crane hook where suitable head room and hoist capacity are available.

Both bucket and crane are protected against opening shock by a pair of adjustable snubbing sheaves. The snubbing action on the closing lines eliminates any shock when the bucket opens—an important feature since the operator cannot control opening speed of a single-line bucket.

Capacities from ⅜ to 2 cubic yards. Write for free bulletin.

THE WELLMAN ENGINEERING CO. 7019 CENTRAL AVE. CLEVELAND 4, OHIO

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For
CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

Robeson Process Company
(Established 1905)

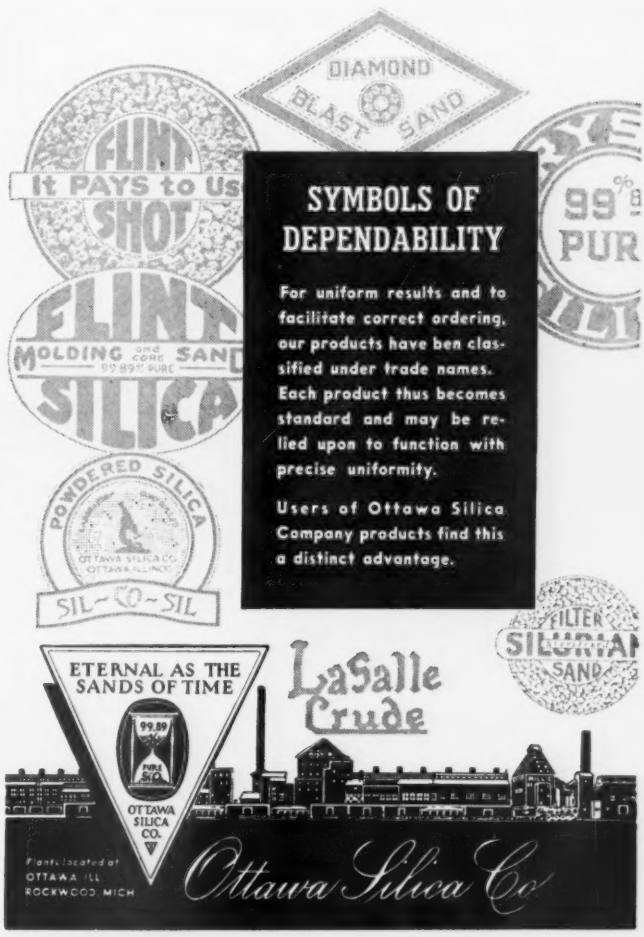
American Gum Products Co.
(Established 1915)

GENERAL OFFICES: 500 FIFTH AVENUE • NEW YORK 18, N. Y.

POWDERED GLASS
AN EXCELLENT BRASS FLUX
—Economical—
THE BASSICHIS COMPANY
CLEVELAND 13, OHIO

CROBAUGH LABORATORIES
Chemists — Metallurgists
FOUNDRY SERVICE
THE FRANK L. CROBAUGH CO.
Phone SUperior 1-4712 CLEVELAND 13, O.

EMPIRE
"THAT GOOD"
FOUNDRY COKE
DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone 3-9135



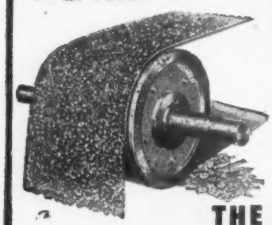
FOR SAND SLINGERS, CONDITIONERS AND CONVEYORS . .

HERE IS THE ANSWER TO YOUR MAGNETIC SEPARATOR JOBS!

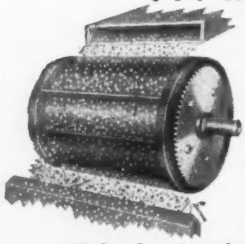
HOMER "Power-Plus" Magnetic Separators

Permanent non-electric—Unaffected by Heat, Cold, Moisture

. . . CAN BE USED INSIDE or OUTSIDE PLANT . . .



Homer MAGNETIC PULLEYS and UNITS —Available in standard diameters from 12" to 30"; belt widths 4" to 60". Special sizes upon order.



Homer MAGNETIC DRUMS—Available in standard diameters from 12" to 30"; face widths 4" to 60". Can be furnished with or without enclosure.

Homer MAGNETIC PLATES—Available in standard widths from 4" to 26"; lengths and number of poles as required. Special fabrications to your specifications.

Write for descriptive bulletins

THE HOMER MANUFACTURING CO., INC., DEPT. 156, LIMA, OHIO

PURO-SEAL FLUX

for producing BETTER BRASS *and* ALUMINUM CASTINGS

Write for Particulars and TRIAL SAMPLE

BALANCED FLUX

PURO SEAL

FOR THE PURIFICATION OF METALS

THE PURO-SEAL COMPANY

9323 WEST 3rd STREET - CLEVELAND 13, OHIO

SERVING THE FOUNDRY INDUSTRY SINCE 1907

CRUCIBLES (all types)

RETORTS, GRAPHITE SHAPES

SUPER REFRACTORIES, FLUXES

BAY STATE CRUCIBLE CO. TAUNTON, MASS. TEL. TAUNTON 4-5121

A. A. WICKLAND & CO.

FOUNDRY CONSULTANTS

ENGINEERING BUILDING · CHICAGO 6, ILLINOIS

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 15.00	$ 13.75	$ 12.50	$ 11.25
2 inches	27.00	25.00	23.00	21.00
3 inches	40.00	36.50	33.50	30.00
4 inches	50.00	46.00	41.50	37.50
5 inches	60.00	55.00	50.00	45.00
6 inches	73.50	66.50	60.00	53.50
7 inches	82.50	75.00	67.50	60.00
8 inches	91.50	83.50	75.00	66.50
1 column	110.00	100.00	90.00	80.00
Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

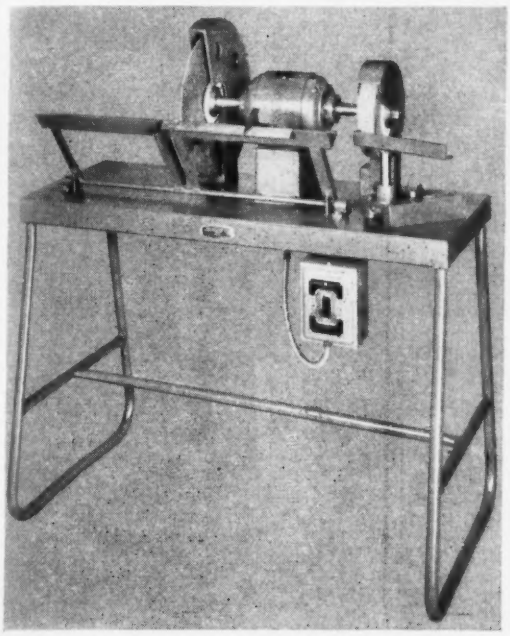
Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

Penton Building, Cleveland 13, Ohio

A New CORE CUTTING OFF and CONING MACHINE



No. 1 CORE CUTTING OFF & CONING MACHINE
Capacity to 3"

This machine cuts off and cones stock cores from 3/8" to 3".

It has a swing rack for holding cores to be cut and an adjustable gauge for measuring length of core, plus a coning rest for coning the cores to any desired angle.

The totally enclosed 1/3 H.P. motor has sealed ball bearings.

The direct drive design eliminates unnecessary parts and consequently greatly reduces maintenance costs.

This unit is being produced for 3 phase, 60 cycle, 220/440 current only.

Available through your Foundry Supply House, or write to:

WADSWORTH EQUIPMENT CO.
562 La Follette St.
AKRON 11, OHIO

TUMBLING BARRELS
Roller Bearing throughout
Direct Motor Drive with Speed Reducer
V Belt Motor Drive—Tight & Loose Pulley Drive
ROYERSFORD FOUNDRY & MACHINE CO.
BOX F
ROYERSFORD, PA.

EF
GAS, OIL AND ELECTRIC FURNACES
For all annealing and heat treating requirements
THE ELECTRIC FURNACE CO. • SALEM, OHIO

MODERN BLAST CLEANING AND VENTILATION
By C. A. Reams

Most approved methods of blast cleaning and ventilation are fully covered from the standpoint of modern practices. A valuable text covering the entire field and its allied equipment.

200 pages
28 tables
38 illustrations

Price
$4.00
Postpaid

THE PENTON PUBLISHING CO.
Book Department
1213 W. 3rd St., Cleveland 13, Ohio

ANALYSIS OF CASTING DEFECTS

133 pages, illustrated
Price $4.25 Postpaid

To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

THE PENTON PUBLISHING COMPANY
Book Department
1213 W. 3rd St., Cleveland 13, Ohio

WANTED

A FOUNDRY ENGINEER...

to join the editorial staff of FOUNDRY

He should be a graduate from an engineering school, not over 35 years of age, have had five or more years' experience in the production phases of foundry operation, and have demonstrated an interest and ability in technical writing.

If you believe you meet these qualifications and are interested, write to the Editor, FOUNDRY, Penton Building, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Help Wanted

WE NEED A CAPABLE FOUNDRY-SALES SERVICE MAN

We are looking for a young man, age 28 to 40. A nationally known and soundly financed company, with an established sales volume, requires sales and service representation in the Northern half of Ohio. Man preferably should live in the North Central portion of the state. We want an ambitious, hard-driving man, who can work without close supervision and who is seeking to provide his own security in the field of sales work. Good salary, plus bonus, with car and expenses furnished. We want a man who can meet the following specifications:

1. Education—college training preferred. Evidence of considerable self-education and improvement will be acceptable.
2. Must have had foundry experience. A sound background of foundry sand use and control will be very helpful in doing a good job on both service and sales development.
3. Should be preferably married and a home-owner, a Christian of moderate habits. "Good-time Charlies" and "Chasers" need not apply, as they can't work hard enough or long enough to please us or our customers.
4. Should have had some sales experience or else display considerable aptitude for sales work.
5. Must have an understanding of, and an interest in, foundry equipment, processes, and the production of better castings.
6. Must be willing to give good references, both as to character and credit relations, and take job aptitude test. We pay all expense for interviews and tests.

Give all details and enclose picture or snapshot with letter of application. All replies will be held and treated in strict confidence.

BOX 709

FOUNDRY **CLEVELAND 13, OHIO**

CASTING SALESMAN

Experienced industrial salesman for ferrous and nonferrous castings in the Detroit area. Not over 40 years of age. Excellent opportunity to represent large producer. Give detailed information as to background, sales experience, and salary expected. Reply confidential. Address: Box 694, FOUNDRY, Cleveland 13, Ohio.

ENGINEERS—DRAFTSMEN

Experienced in foundry layout, equipment details and specifications. Prefer experience in foundry plant engineering or materials handling equipment. Write giving outline of experience and salary required.

LESTER B. KNIGHT & ASSOCIATES, INC.
600 WEST JACKSON BLVD. CHICAGO 6, ILL.

DIE CAST DIE DESIGNER OR PERMANENT MOLD DESIGNER

Light metals experience required. This is a permanent job with unlimited future for qualified man. Position is in modern midwest foundry facility now undergoing expansion. Salary commensurate with ability. Bonus plan. Send complete resume. Address: Box 499, FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY SUPERINTENDENT MANAGER

To set up and operate foundry including obtaining orders and direct operations for newly established nonferrous mechanized plant in New York City area. Must be thoroughly experienced. Kindly state age, experience in detail, including previous employers and length of service and also salary desired. Address: Box 711, FOUNDRY, Cleveland 13, Ohio.

TIME STUDY MAN

Experienced rate setter for Northern Ohio steel foundry and machine shop. Formerly piece work now converting to standard data. Give full details in first letter including salary expected. Address: Box 736, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPPLY SALESMAN

For Chicago and Milwaukee districts. Address: PETERSON FOUNDRY SUPPLY CO., 461 WEST 33rd STREET, CHICAGO 16, ILL.

MECHANIZED FOUNDRY SUPERVISOR

Experienced on conveyor operation of squeezer, stripper and rollover machines for completely mechanized iron foundry, located in the east. Must be a leader capable of controlling men and increasing output. Excellent opportunity with old established company. Address: Box 718, FOUNDRY, Cleveland 13, Ohio.

TIME STUDY MAN

Young, some foundry experience, will train suitable applicant, must be free to travel. State qualifications, age and salary. Address: Box 680, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

In the near future a modern foundry to produce small red brass castings will locate somewhere between Easton, Pa. and Wilmington, Del. This is an expansion of a well established business. Application will be considered from one having some brass foundry experience and a lot of foundry inclination and ambition. Address: Box 734, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Young, some foundry experience, must be free to travel, college graduate preferred. State qualifications, age and salary. Address: Box 679, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

For shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability, and good practical and technical background. Excellent opportunity with long established company of best reputation.

Reply in confidence giving full information as to age, background and experience as well as salary requirements. Address: Box 470, FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER

Experienced in government specified work for largest nonferrous foundry in Dallas. Mechanization under way with machinery, capital and buildings available for increased expansion. Unlimited future for right man. Replies confidential. Write: WAYLAND BOLES, 4369 POTOMAC, DALLAS 5, TEXAS.

GENERAL FOREMAN

For modern production brass foundry. Good opportunity for a hustler. Give complete information about yourself and reference in first letter. Address: Box 714, FOUNDRY, Cleveland 13, Ohio.

WANTED

First class brass molder, good salary. Would consider sharing profits or as partner. Age between 30 and 50 years. Address: Box 712, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

With steel foundry experience or one presently an assistant who feels he can handle a 300 man production plant. Location Northern Ohio. Give full details in first letter including salary expected. Address: Box 735, FOUNDRY, Cleveland 13, Ohio.

GOOD OPPORTUNITY

FOR POTENTIAL PLANT SUPERINTENDENT

Aggressive man between 35 and 45 years of age needed in well established company. Needs pattern background and extensive experience in planning and process control in steel foundry industry with emphases on light and medium castings up to 5 tons in weight.

BOX 727

FOUNDRY **CLEVELAND 13, OHIO**

Help Wanted

SUPERINTENDENT FOR FOUNDRY

Employing approximately 100 people. Must be experienced all phases of foundry work. Will be required to produce good quality castings at low cost. Must know iron analysis. Give details of experience, salary requirements first letter. All replies confidential. Address: Box 715, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

For large aluminum sand foundry in the Middlewest. Must be experienced in foundry operations. Address: Box 581, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Experienced in production and jobbing work in aluminum and brass foundry. Wanted for Northern Ohio. State full details in first letter. Address: Box 708, FOUNDRY, Cleveland 13, Ohio.

Representative Wanted

REPRESENTATIVES WANTED

Well established manufacturer of core oils, refractory cements and foundry facings wants experienced salesman or manufacturers agent in Chicago and surrounding territory. Excellent opportunity for good earnings. State full experience, age, etc. in reply. Address: Box 689, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY REPRESENTATIVE

Prominent Eastern Aluminum and Bronze foundry, producing high quality castings of sand and permanent mold is in a position to accept additional work from only well-rated firms. Address: Box 691, FOUNDRY, Cleveland 13, Ohio.

METALS, MINERALS & CHEMICALS

Salesman for exclusive territory on high commission basis. Write full and complete personal and sales data in confidence. Include small photo, map, etc. Address: BRAM CHEMICAL CO., 820—65th AVE., PHILADELPHIA 26, PA.

Accounts Wanted

ACCOUNTS WANTED

Well established with large following wishes to hear from manufacturers of equipment, supplies or products for representation in New England. Twenty years of experience in sales, engineering and consulting. Address: Box 722, FOUNDRY, Cleveland 13, Ohio.

Opportunities

OPPORTUNITY

Small, well equipped iron foundry, for sale, lease or operation on share basis to capable foundryman who can make our castings of light and medium floor type and squeezer work. Foundry has jolt squeezer, plain squeezers, rollover machines, mechanical charger, etc. Location North Central Indiana. Address: Box 739, FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

Employment Service

Employment Service

EMPLOYMENT COUNSEL, INC.
"All The Name Implies"
JOHN COPE, Manager Foundry Dept.

Recruiting men for employers in the foundry industry throughout the nation. Openings in Steel, Malleable, Gray Iron and Non-Ferrous—Jobbing and Production. Salaries to $20,000.

PLANT MANAGERS	SUPERINTENDENTS
GENERAL FOREMEN	MOLD FOREMEN
CORE FOREMEN	MELTING FOREMEN
CLEANING FOREMEN	MAINTENANCE FOREMEN
PATTERN FOREMEN	METALLURGISTS
INDUSTRIAL ENGRS.	TIME STUDY ENGRS.

And all other Administrative and Sales Positions.
WRITE or CALL for registration.
Completely Confidential

SUITE 500
CHICAGO 2, ILLINOIS

7 WEST MADISON ST.,
FINANCIAL 6-2100

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: **R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.**

Positions Wanted

PATTERNMAKER

Both wood and metal. Know matchplate and precision castings work. Capable of running small shop as working foreman. Address: Box 729, FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 603, FOUNDRY, Cleveland 13, Ohio.

FOREMAN OR SUPERINTENDENT

Practical gray iron foundryman desires position as foreman or superintendent in production or jobbing shop. Thirty years in foundry game, ten years as foreman and superintendent. Green and dry sand, squeezer and bumper work. Address: Box 720, FOUNDRY, Cleveland 13, OHIO.

BRASS FOUNDRY SUPERVISOR

With 35 years' practical experience from molder to superintendent is open for an offer. Experience covers many lines from light to heavy castings. Production and jobbing—prefer medium or small shop, East or Mid West. Best of references on character and ability. Address: MR. T. E. LaMONDY, 112 GLENDALE AVE., ELKHART, INDIANA.

STEEL FOUNDRY SUPERINTENDENT

Or assistant—twenty years in supervision casting from one lb. to 40 thousand. Production—all types molding machines, slingers and sand control. Address: Box 737, FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP SUPERINTENDENT

In some large foundry producing grey iron or malleable iron castings in large quantities. Location not a prime factor. Twenty years' experience. Address: Box 676, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Experienced in gray iron and some nonferrous on both production or jobbing basis. Exceptional background of practical and technical training. Cost minded and have the best in references. Eighteen years of executive background. Address: Box 707, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Would like part time position as consultant in setting up Nodular Iron procedure. Considered the expert in this field. Also A-1 foundryman. For further information address: P. O. BOX 21, BRIDGEPORT, CONN.

Positions Wanted

MANAGER OR SUPERINTENDENT

A top notch foundryman with twenty-one years' experience in all phases of foundry work. Desires position as manager or superintendent in medium to large company, jobbing or production, alloy, semi-steel and gray iron. Now employed, available on short notice. Address: Box 726, FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVE

Selling grey iron and alloy castings. Production and jobbing A-1 accounts. Location—Michigan. For particulars address: Box 719, FOUNDRY, Cleveland 13, Ohio.

CHARGE OF GRAY IRON JOBBING SHOP

Veteran 28 years of age wants charge of grey iron jobbing shop running 10 to 20 tons per day. Ten years' experience in molding and supervision. Excellent cupola practice. Address: Box 724, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-two years' experience in the foundry. Ten years' practical experience and twelve years as supervisor. Light production to heavy jobbing work. Practical experience in every department. Cost minded and progressive. Now employed. Address: Box 733, FOUNDRY, Cleveland 13, Ohio.

MANAGER—ASSISTANT TO PRESIDENT

Steel, iron, brass. Thoroughly experienced in every shop operation, metallurgy, engineering, accounting and management. Excellent ability to develop a superior organization by leading, teaching and example. Outstanding reputation for keen analysis, sound judgment and a rare combination of practical experience, managerial ability and effective personality. Address: Box 375, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Dependable and experienced metallurgist and electric melter—acid and basic practice, laboratory, melting, heat treat and sand control. Capable of increasing quality control and elimination of trouble causes with use of technical and practical experience and overall foundry knowledge. Looking for responsible position with reliable electric steel foundry. Address: Box 704, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN EXECUTIVE

Grey iron-malleable — practical molder, melter, metallurgist experienced executive and consultant desires connection with company needing a man of my experience. Address: Box 731, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE POSITION

Desired by young family man. Sound scholastical and practical background includes a four year apprenticeship, melting, molding plus sand and laboratory supervision, also technical advisor. Now sales representative for large midwest foundry. Interested in managing a medium sized foundry or acting in a junior executive capacity for large capture or free foundry group. Address: Box 740 FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Capable of taking full charge of small or medium foundry—gray iron, nonferrous. Broad experience in producing quality light and medium castings. Well versed in production problems and scrap control. Salary or salary and production bonus. Midwest preferred. Address: Box 738, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Available Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

IMMEDIATE CAPACITY AVAILABLE

For semi-steel castings, pressure type as well as usual run of work. Quantity runs of 100-500 lbs. castings. Jobbing lots of castings 500 to 10,000 lbs. Address: DARLING VALVE & MFG. CO., WILLIAMSPORT, PA.

AVAILABLE CAPACITY

Patterns—wood, metal—driers, jig and die patterns. Prompt delivery, near Detroit. Address: BOX 730, FOUNDRY, Cleveland 13, Ohio.

Capacity Wanted

SQUEEZER CAPACITY WANTED

Experienced foundry salesman now employed wants permanent connection with growing mechanized shop. Have active accounts Central Indiana and Eastern Illinois in industrial, automotive and agricultural fields. Mostly squeezer in class 20 to 30 iron steady running jobs. Manner of compensation negotiable. Address: Box 716, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED TO BUY

Steel Apron Conveyor for hot castings, 18", 20", 24" or 30" wide.
Pottstown Tapping Machines.
2—14" Cyl. Jolt Squeeze Stripper Molding Machines
2—16" Cyl. Jolt Squeeze Stripper Molding Machines
1—14" Cyl. Rollover Molding Machine

STEEL FLASK EQUIPMENT

18—14 x 16 6" Drag 4" Cope
18—12 x 18 6" Drag 4" Cope
24—12 x 23 6" Drag 4" Cope
18—14 x 20 7" Drag 7" Cope
12—16 x 16 6" Drag 6" Cope
12—18 x 18 6" Drag 9" Cope
24—18 x 18 6" Drag 6" Cope
24—24 x 24 7" Drag 7" Cope
18—16 x 26 6" Drag 6" Cope

NATIONAL FOUNDRY COMPANY OF NEW YORK, INC.
2-56 SANDFORD ST. BROOKLYN 5, NEW YORK

WANTED

FOUNDRY EQUIPMENT of all types.

We are Equipped to Dismantle.

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CINCINNATI 32, OHIO

WANTED

3—teapot ladles, 10,000 pound capacity
1—International air turnover, air draw machine, 50" x 30". Address: Box 717, FOUNDRY, Cleveland 13, Ohio.

WANTED

Steady supply of novelty castings and antique reproductions, rough or finished, direct from foundries by a rated company. Send prices, pictures or samples if possible. Address: Box 732, FOUNDRY, Cleveland 13, Ohio.

WANTED

Used 1½ meter applied research laboratory spectrograph, non-recording densitometer, source unit and film processing equipment.

BOX 93 STATION D
TOLEDO, OHIO

Wanted-To-Buy

WANTED

BRIDGE CRANES

ARNOLD HUGHES COMPANY
765 PENOBSCOT BLDG. DETROIT 26, MICH.
WOODWARD 1-1894

WANTED

Medium sized malleable or steel foundry located in the middle west. Write complete details in first letter to:

BOX 728
FOUNDRY CLEVELAND 13, OHIO

WANTED

SANDSLINGER WANTED—Junior Tractor. Address Box 656 FOUNDRY, Cleveland 13, Ohio

---

WANTED

One used screenerator and one mullbarrow, used. Address: GRUBBS FOUNDRY, 4700 ROSA ST., EL PASO, TEXAS.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

SMALL FOUNDRY FOR SALE

Complete foundry, well equipped. Main building 60' x 110'. On railroad. Prompt possession. Priced right. Terms can be arranged. Write or wire:

PRECISION FOUNDRIES, INC.
BOX 2527 TULSA, OKLAHOMA

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOUNDRY—GRAY IRON

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story height 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Will receive offers on buildings and equipment known as Kelly Foundry and Machine Co., Goshen, Indiana. Has Big Four R.R. siding, 45,000 sq. ft. 72" cupola. Heirs wish to dispose of property at once. Will be sold at a bargain Address: ECKSTADT & LEER, 39 SHOOTS BUILDING, GOSHEN, INDIANA.

FOUNDRY FOR SALE

In large Western city. Established 39 years. Grossed $65,000 last year. Demand exceeds present output. Room for vast expansion. Priced to sell. Address: KASHFINDER, WICHITA, KANSAS.

SOIL PIPE FOUNDRY FOR SALE

2" and 4" pipe, 75 different fitting patterns. All master patterns for machines, flasks and fittings. Capacity $1000 per day. Real bargain.

HERBERT J. BROWN
2008 PORTLAND AVE. SHREVEPORT, LA.

Foundries For Sale

FOR SALE

Wisconsin nonferrous foundry and manufacturing, 60 miles from Chicago. Have large volume of rated orders. With increase in government expenditures, you should clear this in one year. Price $55,000. Retiring. Address: Box 504, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

GRAY IRON jobbing foundry in Western New York state. Going business presently producing 6 to 7 tons daily. Full particulars upon request. Address: Box 713, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOUNDRY EQUIPMENT FOR SALE

Champion Core Blowers CB 12 Serial No. 6736
Champion Core Blowers CB 15 Serial No. 6738
Champion Core Blowers CB 400 Serial No. 6744
The above core blowers were purchased new in 1945 and have not been in use. They are a good buy for a party who needs core blowers.
We have four elevators for sale as follows:
Elevator D 29' Chain 58⅝' Dual Chain
Elevator F 43' Chain 86' Dual Chain
Elevator S 40' Chain 84' Dual Chain
Elevator R 47' Chain 95' Dual Chain
There are four speed reductors as follows:
(3) Horsburgh & Scott Worm Gear Speed Reducers Series WB2400, Class I, Ratio 45:1 17 HP Input, Speed 1750 R.P.M.
Two, Serial C1563 and
One, Serial C1648
(1) Horsburgh & Scott Worm Gear Speed Reducer Series WB2000, Class I, Ratio 45:1 11.5 HP Input, Speed 1750 R.P.M.
Serial No. C640
These elevator casings are 4'-6" x 2'-6", the elevator buckets are 8" x 19" x 7" deep, Farrell No. 85. Mounted on chain with 3 1/8" pitch.

FRANK FOUNDRIES CORP.
MUNCIE, IND.

FOR SALE
SAND BLAST EQUIPMENT

Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blade. Price 30% of list. Wheelabrator #1 Tablast 4" dia. with tables and dust collector—$3250.
Sand Blast Cabinets, pressure-tanks, dust collectors and blowers.
2—Tumble air blast barrels, Model 1GF, cap. 150 lbs.
8 ft. LF Pangborn blast table. Like new.

DIAMOND SALES INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
2250	24 oz.	Spencer	25	220/440	
2700	16 oz.	Spencer	20	220/3/60	1750
1300	16 oz.	Spencer	10	220/3/60	1750
650	16 oz.	Spencer	10	220/3/60	3600
550	20 oz.	Spencer	5	220/3/60	3475
450	40 oz.	Spencer	7½	220	1750
400	16 oz.	Spencer	3	220/3/60	3500

PRESSURE BLOWERS (3 Phase, 60 Cycle)

9100	7" SP	Sturtevant			1900
4500	16 oz.	G E.	30	440	3600
8150/6250	7oz.	Sturtevant	15	220/440	1800
2500		Bishop & Babcock (40½x50 outlet)			
2300	1" SP	Clarege	3	220/440	1800
800	8 oz.	Nth.Amer.	3	220	3600
660	20 oz.	AllenBillmyre	7½	440	3600
450	6 lb.	A&B	30	220/440	3450
400	4.3 oz.	Spencer	2	220/3/60	3500
340	20 oz.	AllenBillmyre	3	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

2—International type "F" 27" x 12", Stationary
4—International type "G" 20" x 8", Portable
1—International Jolter, 16" x 24", Portable
1—Simplicity type "S-S", 4' x 8', Vibrating Screen, 5 HP A.C. motor
2—Royer Size "D" Separators, Portable
1—Core Blower (San-Bio)
1—3-ton P & H 2 motor electric Hoist, 220 D.C.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

For Sale

FOR SALE

MOLDING MACHINES
2—Deuscher Stationary jolt squeeze
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers

BLOWERS FOR CUPOLAS AND FURNACES
10—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
1—#47 Connersville-Acme
2—#59 Connersville-Acme
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP

METAL MELTING EQUIPMENT
5—1000# open flame brass melting furnaces, gas fired
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.

TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room

MISCELLANEOUS
1—NC-4 sand separator
1—NB-2 sand separator
1—#1 Demmler core blower
1—American sand cutter 50" blade
1—2-Station Handy Sandy
1—#1 Blystone sand mixer, motor drive
2—#16 Roto-clone units complete
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

One No. 5 Modern Equipment Co. 63" shell cupola with charger and Ingersoll-Rand blower 4300 CFM at 1½ lbs. pressure. Operated six months. Make offer. Address: STA-RITE PRODUCTS, INC., DELAVAN, WISCONSIN.

FOR SALE

ROLLER CONVEYOR

all sizes & types

ALLIED MATERIALS HANDLING COMPANY

4657 SPRING GROVE CINCINNATI 32, OHIO

SANDBLASTING EQUIPMENT FOR SALE

Pangborn 6' LS table direct pressure with abrasive conveyor separator, 4AQ1 generator, four nozzles designed for wheel peening, shot peening or flat work. Price—$1000.
Pangborn 4' LE table suction type. Price—$375.
Pangborn 2 FG tumbling barrel capacity 250 pounds of work. Price—$350.
Pangborn 1 GF barrel capacity 150 pound of work. Price—$250.
Pangborn cabinet EN 2 suction type 3'x5'x7'. Price—$250.
Dust collectors, wheelabrators, roto blast and sand blasting parts in stock.

M. ELSTEIN
141 MANGIN ST. NEW YORK 2, N. Y.

FOR SALE

1—5'6" x 32'2" x 6'8" high Swartout Insulated Core Oven—4 sections—16 prs. Steel hinged doors, equipped with Carl Mayer recirculating heating system consisting of 2—40" Diam. x 72" steel plate, brick lined, heating furnaces, also 2 blower fans and equipped with 2—#5 Model S Varpofiers complete.
2—4'6" x 14" x 4'10" Atlas steel 46" gauge Core Oven Cars equipped with five shelves.
1—36" Perkins Man Cooler with floor pedestal and guard—complete with 5 HP Westinghouse induction motor—220 volts 12 amps—110 rpm —3 phase—60 cycle with Cutler-Hammer starter.
1—Bell Prime Mover—Model #343—Serial #105 —gasoline operated.

SUBJECT TO INSPECTION AT OUR PLANT
G. & C. FOUNDRY CO.
SANDUSKY, OHIO

For Sale

ARE YOU LOOKING FOR STEEL FOR A NEW BUILDING?

We have available steel framework for a building 60' x 140' long and 21'6" to the bottom cord of truss. Columns are mounted with brackets for crane way. Send for additional information, if interested. This material can be purchased without priority. Address: BERGEN POINT BRAS FOUNDRY, INC., AVENUE A AT SIXTH ST., BAYONNE, N. J.

FOR SALE

2—24" x 30' Belt Conveyors, 5 H.P. motor, 220/440 V.
2—#405-79 Osborn Rollover Molding Machines, A-1 cond.
2—#814-P Osborn Jolt Squeeze Strippers, 14" squeeze cyl., 700# jolt cap., like new.
2—#602 Osborn Jolt Rollover and Pattern Draw, A-1 cond.
2—#147-1 Osborn Rockover and Draw Machines, specially built for long jobs, A-1 cond.
1—Herman Rollover Molding Machine, 18" cyl., 40" x 60" table, new.
1—Herman Rollover Molding Machine, 22" cyl., 42" x 72" table, A-1 cond.
2—Herman Jolt Stripper Molding Machines, 40" x 72" table, ser. #4109, 4110, A-1 cond.
5—#103 Milwaukee Jolt Squeeze Molding Machines, A-1 cond.
1—#94 Osborn Core Blower—new.
4—SB-12 International Core Blowers.
1—Pangborn 28 cu. ft. Rotoblast, Type CK with Power Loader.
1—Pangborn 12 ft. dia. Tableblast No. 30 complete with Dust Collector.
1—Dust Collector, Parsons #118 complete with 20 H.P. motor & blower.
4—Tumbling Mills, 30" x 60" with 15 H.P. motor.
2—Double Stand Grinders with 10 H.P. motors.
1—40 H.P. Air Compressor, Pennsylvania, water cooled.
1—Bartlett & Snow Bucket Elevator, 60 ft. high, bucket 5" x 7½" x 4½" deep, mounted on heavy chain, 5 H.P. 220/440 V., 3 ph, 60 cy.
1—Bartlett & Snow Chain Conveyor, 58 ft. long, 6" wide, 7½ H.P. 220/440 V., 3 ph, 60 cy.
Misc.:—Other foundry equipment.

Steel Flask Equipment
98—19" x 26", 3" x 6" drag, 4" cope
180—19" x 16", 3½" drag, 4½" cope
28—17" x 27½", 4" drag, 4" cope
45—22" x 28", 4" drag, 4" cope
30—14" x 30", 3" drag, 4" cope—Sterling—New
12—16" x 27", 4" drag, 4" cope
10—24" Rd., 5" drag, 9" cope
30—25" x 26", 5" drag, 13" cope
20—17" x 26", 5" drag, 12" cope

All copes are barred

Euclid Foundry & Machine Equipment Co., 15019 Saranac Rd., Cleveland, Ohio (10) Telephone—Glenville 1-1538.

FOR SALE

Core oven—8 x 16 x 5 high inside, complete with controls, 4 monorail lines, 26 racks—$3000.00.
Ruemelin AG, 48 x 30 sandblast cabinet—$250.00.
Pneumatic core truck—Chicago Mfg. Model D-1 (like new) $100.00.
Wheelbarrows, castered casting boxes, jib crane, etc. List on request. Core oven diagram on request.

PHILLIPS MFG. CO.
BOX 70 ALMA, MICHIGAN

CUPOLAS

2 No. 7 Modern Equipment Co. cupolas with inclined charger, weigh hopper, scale and blower. Almost new. AS IS AND WHERE IS, Greensburg, Indiana.

DUST COLLECTOR AND FAN HOUSE

Parsons #138 Dust Collector and 10'8" fan house, complete with fan and motor. In excellent shape, "AS IS AND WHERE IS", Greensburg, Indiana.

SANDSLINGER, BEARDSLEY AND PIPER MOTIVE JR.

Complete with cable and replacement parts, F.O.B. Detroit.

BOHN ALUMINUM & BRASS CORPORATION 1400 LAFAYETTE BLDG., DETROIT, MICHIGAN

CONVEYER

Trolley Chain with 4" I beam track. 850 feet. 80# load per foot with many vertical bends and radius roller turn, with 425 ball bearing trolleys and carrying attachments with floating caterpillar drive. Complete in every detail. Used very little, just like new. Inquire:

INTEGRITY SUPPLY INC.
305 NORTH FRONT ST., COLUMBUS, OHIO PHONE, MAIN 6371

FOR SALE

1—Coleman tower oven, 27 carriers 84" x 25", overall height of oven 45', 9'8" long, 9'2" wide, recirculating air type combination oil and gas fired—45 minutes to 180 minutes, baking cycle temperature 0 to 500 degrees Fahrenheit. Like new. Address: REDSTONE INDUSTRIES, INC., 518 SECOND NATIONAL BANK BLDG., UNIONTOWN, PA. TELEPHONE 8-3527.

FOR SALE
IMMEDIATE DELIVERY

1—Ransohoff Cleaning Mill 48" x 72", Side Loading, Side Unloading—Star Return—with Sand Handling Conveyor complete with tank, pump, switches and motors.—Excellent Condition.

FOUNDRY HOIST

1—3 ton R & M 2 motor AC foundry hoist.

IMMEDIATE DELIVERY
AIR COMPRESSOR

1000 cfm Chicago Pneumatic 100# pressure 2300 or 440 v, A.C. 257 r.p.m. syn. mtr. Complete with starting equipment and all accessories.

DUQUESNE ELECTRIC & MFG. CO.
6428 HAMILTON AVE.
PITTSBURGH 6, PA.
TELEPHONE MO-1-5800

FOR SALE

Osborn #91-10 core blower with sand reservoir of 8½" x 15" opening, blow plate to suit, table wearing stool, horizontal clamps, all valves and fittings integral with the machine and equipped with manually controlled hand foot operating valve. This unit purchased new in 1944; has been slightly used and in very good condition. Address: Webster Manufacturing, Inc., Tiffin, Ohio.

FOR SALE

40—10' sections of Lamson roller gravity conveyors, each section 10' long, 2½" diameter rolls #10 gage 24" long rolls on 3" centers in high position between 4¼" x ¼" thick, uniframe side members. Never used, will sell for $95.00 each section, F.O.B. our factory. Present price $118.00 each F.O.B. Syracuse. Address: THE LUDLOW VALVE MFG. CO., INC., TROY, NEW YORK.

FOR SALE

12" x 12" Dings Type X Magnetic Separator, complete with electronic rectifier and geared head A.C. motor, push-button control. Serial 16747.
Type SKG No. 88 Lancaster counter-current Rapid Batch Mixer; motor driven.
127 Sets—14" x 20" Steel Flasks.

M. COOPER
2415 NO. DAMEN AVE.
CHICAGO, ILL.

FOR SALE

1—#243 Osborn jolt, rockover and pattern draw molding machine. Never used since being completely rebuilt.
1—8'x10' Sly sand blast room with dust arrestor. Complete and in good condition.
1—Nicholls jolt squeeze molding machine. 10". Good condition.

MAGNOLIA MACHINE & FOUNDRY CO.
P.O. BOX 579 MAGNOLIA, ARKANSAS

FOR SALE

1—20 x 27 Wheelabrator, rubber conveyor belt. Excellent condition—with spare parts—$2500.00.
1—Sklenar furnace, twin burner oil fired. Condition excellent—$950.00.

BUCK IRON COMPANY
ROUTE #1 QUARRYVILLE, PA.

FOR SALE

Sand Cutter—American Wheelabrator #79-60" model "M" sand cutter. Slightly used, up-to-date model, good as new. Contact

NEENAH FOUNDRY COMPANY
NEENAH, WISCONSIN

FOR SALE

Extra heavy soil pipe fitting patterns, meeting all specifications. Tons of castings have been produced from these patterns. All types molding machines, core blowers, pattern plates, vibrators, general foundry equipment and pattern shop equipment. All priced for quick sale. Let us know your requirements. Address: Box 723, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

FOR SALE

3—two million BTU — 2—400,000 BTU Dravo direct fired gas forced air space heaters. Burn either natural or LP gas. Convertible to oil. Excellent for large space heating.

LUTHE HARDWARE COMPANY
DES MOINES IOWA

FOR SALE

1—Young Brothers Electric core oven, 220 volts, 3 phase, 60 cycle, ¼ H.P. motor, temperature controls, inside height 38", width 24", depth 18". Like new.

E. J. WOODISON CO.
7415 ST. AUBIN AVE. DETROIT 11, MICHIGAN

FOR SALE

International Core Rollover
Type AN
Size 40" x 20"
New 1946—Used one week

BRM MACHINERY CORPORATION
55 EVERGREEN AVENUE
NEWARK 5, NEW JERSEY

FOR SALE

2—30 HP U.S. Syncrogear Motors 220/440/3/60 ratio 5.07, Geared Speed 350 RPM.

1—5 HP U.S. Syncrogear Motor 220/440/3/60 ratio 13.5, Geared Speed 135 RPM.

Also other motors and pumps from practically new HydroBlast System.

KULKA INDUSTRIAL CORPORATION
ALLIANCE, OHIO
PHONE 6255

FOR SALE

No. 8 cupola and charger complete—including weigh hopper, transfer car and bucket. New in 1948.

AUBURN FOUNDRY, INC.
AUBURN, INDIANA

FOR SALE

1—Ingersoll-Rand Type FS345, 4000 CFM 125 lbs pressure 3500 RPM direct connected motor driven centrifugal air blower with 30 HP, 220/3/60 motor and controls. Purchased new in 1944.
1—Ingersoll-Rand Type G motor blower 2200 CFM, 16 oz. pressure with 15 HP, 220/3/60 open motor. Purchased new in 1944 and never used.

BEDFORD FOUNDRY & MACHINE COMPANY
BEDFORD, INDIANA

For Sale

FOR SALE

2—#404 used Osborn rollover jolt machines.
3—#102 used Osborn plain jolt machines.
Complete specifications on request. Subject to prior sale. Wire or write:

ROOM 558
212 ESSEX STREET BOSTON 11, MASS.

FOR SALE

1—Simpson intensive mixer #3, with motor and gear box.
3—International Molding machines, 20" type "G", 8" draw, power rollover.
8—International Molding machines 20" type H.J. 6" draw hand rollover.
2—Johnson & Jennings molding machines, #612, 8" draw. Inquiries to be addressed to:
OHIO MALLEABLE IRON CO.
COLUMBUS 16 OHIO.

FOR SALE

One 12,500 cfm Uni-wash shakeout booth. 12½ ft. long, by 4 ft. wide, by 8'9" high. Complete with hood, water chamber, fans, drives and totally enclosed 15 HP, fan cooled motor. In excellent condition. $1,250.00 F.O.B. Grand Rapids, Michigan.

GRAND RAPIDS FOUNDRY
548 BOND AVE. NW
GRAND RAPIDS 2, MICH.

FOR SALE

1—Used model "M" Beardsley & Piper screenerator in good operating condition. 3 phase, 60 cycle, 220 volt, motor. Price $400.00 f.o.b. Little Falls, New Jersey.

NORTH JERSEY FOUNDRY CO., INC.
453 MAIN STREET
LITTLE FALLS, NEW JERSEY

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine
1—Schneible Multi-Wash Dust Collector for 6500 CFM.

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

FOR SALE

1—250 pound Lectromelt furnace, complete with transformer and controls.
1—Ajax 35 KW induction furnace.
All equipment in good condition.

ILLIUM CORPORATION
P.O. BOX 478 FREEPORT, ILLINOIS

FOR SALE

#4 U. S. Rotary melting furnace complete. Ser. No. 232—capacity 2000 lbs. brass. Practically new. Adaptable for oil or gas firing.

BURNDY ENGINEERING CO. INC.
2960 LEONIS BLVD. LOS ANGELES 58, CALIF.

FOR SALE

1 Molding Machine manufactured by Herman Pneumatic Company — power jolt, roll and draw 60" x 84". Jarring capacity 18,900 lbs.

PURCHASING DEPARTMENT
MINNEAPOLIS-MOLINE COMPANY
MINNEAPOLIS 1, MINNESOTA

FOR SALE

Tabor cutoff machine—10 horsepower. Address: Box 710, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

2—Model CW Sanstorm sandblasting machines in original crates, suitable for sandblasting small parts. Address: Box 721, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Three Mercury platform lift trucks—AAA-1 shape. Complete with batteries and battery charger. About one-third new price. Subject to prior sale. Address: INDIANA PRODUCTS COMPANY, Box 539, KOKOMO, INDIANA.

For Sale

FOR SALE

1—Pangborn ROTO-BLAST type SLGS-421, 8 feet dia. table with 6—30" rotary tables. Complete with motors, dust collector and shot handling and reclamation. Used very little. Condition like new.
2—Redford Bench BLOWERS. Extra cartridges.
2—Cl-10 Claridge Centrifugal Blowers, with 30 HP 3450 RPM, 440 V. Motors, 10" valve & adapters, 3500 CFM @ 14" Pressure.
2—Six T. Cab operated Bridge Cranes. Approx. 17' Span. & Repair parts.
1—Geared Ladle 20" Dia. x 22" open top, & Geared Ladle Handler.
1—#79—60" Type M Am. F. & Equip. Co. Sand Cutter. Rider type unit, Elec. operated with reversing feature. Repair parts. Excellent condition. Excellent buy.
1—Complete Sand Testing Equipment Set.
1—6" Curtis AIR HOIST, 4 ft. lift.
PARTIAL LISTING

FOUNDRY EQUIPMENT & SUPPLY CO.
2970 W. GRAND BLVD.
DETROIT 2, MICH.

FOR SALE

3—Tilting Swing Head cover brass furnaces, 400 lb. crucible.
2—Gyratory Elec. Riddles.
2—24" Elec. Riddles.
1—American Sand Cutter Machine Size 89/70 M.
1—Sprue Cutter with 2 HP. Motor.
1—24 x 54 Sly Tumbling Mill.
1—36 x 54 Late Model Whiting Tumbling Barrel complete with Jones Speed Reducer and 7½ HP. Motor.
1—#55 Demmler Core Blower
1—Wells Metal Band Saw Type 9M42.
1—Micromax Tester, Wall Type, to 2400, made by Leeds & Northrup Co., Philadelphia.
1—North American Blower, 2 HP. Motor, 3520 RPM., 220 or 440, 3 phase, 60 cycle, 320 CFM.
1—General Blower Motor, 3 HP. 16 oz. pressure, 220 or 440, 3 phase, 60 cycle, 375 CFM.
1—3 Ton Shaw Box, Elec. Hoist, New.
1—Jeffrey Sand Conditioner.
28—Truscon Pressed Steel Flasks, 19 x 20, 8 Cope, 8 Drag.
11—Truscon Pressed Steel Flasks, 22 x 23, 10 Cope, 10 Drag.
91—Truscon Pressed Steel Flasks, 15 x 20, 8 Cope, 3 Drag.
4—Truscon Pressed Steel Flasks, 22 x 24, 11 Cope, 9 Drag.
36—Truscon Pressed Steel Flasks, 16½ x 33, 8 Cope, 3 Drag.
9—Truscon Pressed Steel Flasks, 12 x 27, 7 Cope, 3 Drag.
11—Round New Pressed Steel Flasks, 20" Diameter, 6 Cope, 4 Drag.
10—Round New Shanafelt Steel Flasks, 41" Diameter, 7 Cope, 6 Drag.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE
IN STOCK

100—MOLDING MACHINES, all types.
35—MELTING FURNACES, all types.
14—TUMBLING BARRELS
6—CORE OVENS
5—CUPOLAS
16—LADLES, all sizes.
45—BLOWERS
5000 feet ROLLER CONVEYOR
SEND FOR FIVE PAGE LISTING.

UNIVERSAL MACHINERY & EQUIPMENT CO.,
320 EAST BROAD STREET,
SHILLINGTON, PENNA.
R. B. HARRISON, MGR. FDRY. DEPT.
PHONES—READING 30311 - 40146.

FOR SALE

20 Foundry hoppers, like new. 1—large foundry furnace. Address: EASTERN STATES STEEL PRODUCTS CORP., 36 COOK STREET, EAST BRIDGEWATER, MASS.

FOR SALE

1—Type "S" Beardsley & Piper screenarator #2156—excellent condition. Address: FEDERAL BRONZE PRODUCTS, INC., 2 WHEELER POINT ROAD, NEWARK 5, NEW JERSEY.

FOR SALE

HYDRO-BLAST CLEANING SYSTEM
For dustless core removal, surface cleaning, sand recovery. Complete equipment as removed from large foundry discontinuing business. Used very little. Stored in San Francisco. For details communicate: H. W. SOULE CO., 2106 FORTY-SIXTH AVE., SAN FRANCISCO 16, CALIF. PHONE LOMBARD 6-2805.

For Sale

FOR SALE

Now removing from large Cincinnati foundry, the following items, some new and some less than two years old.

Pangborn—AIR SHOT BLAST ROOM, complete with 11 ft. dia. turntable, all motors, controls, etc. Ready for operation. Model U.S.1.
Osborn—JOLT ROLL OVER MACHINE, Model 405, 19 x 56
Osborn—JOLT STRIPPERS, Model 405, 21 & 53
Osborn—JOLT ROLL OVER, Model 406, 36 x 24
Osborn—JOLT STRIPPER, Model 406, 36 x 52
Herman — 6000# series ROLLOVER-PATTERN DRAW MACHINE 50 x 60 table, 15" cylinder, 40 x 60 table independent Jar Machine as complete unit.
(1) Herman—6000# series JOLT-STRIP MACHINES, 48 x 54 table, 12" draw.
Modern Eqpt. Co. CUPOLAS #9
R-C POSITIVE BLOWER 12 x 20, 20 hp
R-C POSITIVE BLOWER 22 x 66, 75 hp
MIXING LADLES, 1000# cap. to 4000#
V.C.G.-3 SUPER GYROSET SHAKE OUT, 6' x 8' deck, complete—plus large quantity FLASKS of all sizes.
(2) #276J Osborn SQUEEZER MACHINES—large size
(2) Osborn SQUEEZER MACHINES—regular size
(3) PKL 14 Int. JOLT SQUEEZE PIN LIFT MACHINE
PKL 12 Int. JOLT SQUEEZE PIN LIFT MACHINE
Am. SAND CUTTER, Model AA, #111, 7½ hp. 220 V
(2) Webster & Perkins PEDESTAL GRINDERS, 1200 rpm
Everett STAND PEDESTAL GRINDER
Gardner GRINDER, 52" horizontal, 20 hp
TUMBLAST CABINET, Pangborn, model 1172A, ser. #7412911, gravity feed or air blast, 30" x 40" barrel model 2 GD1, 2.7 rpm. Uses sand or shot. Good Cond. All motors A.C. $1000.000 fob.
SAND SCREENARATOR, Beardsley & Piper Model S, 3/60/220/440 volt, steel wheels. $325.00 fob.
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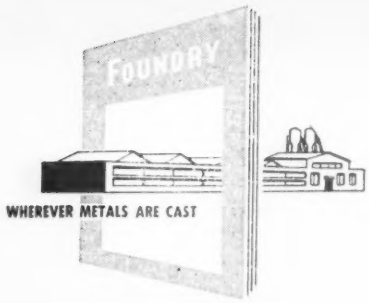

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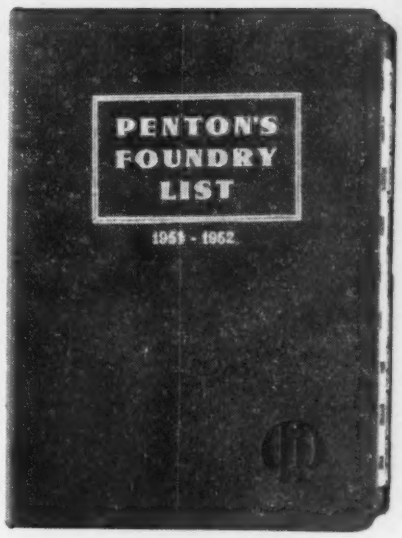
of today's Foundry Market



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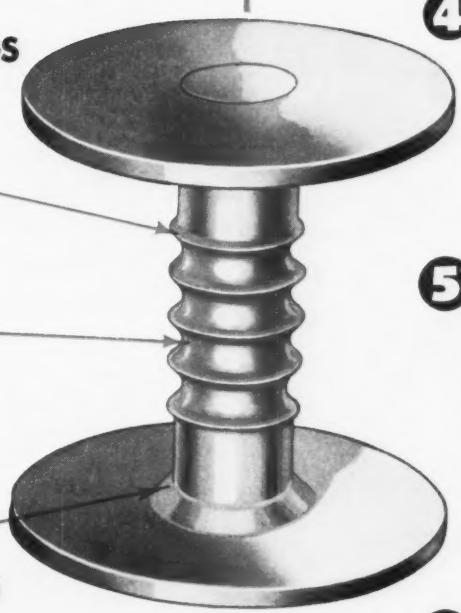

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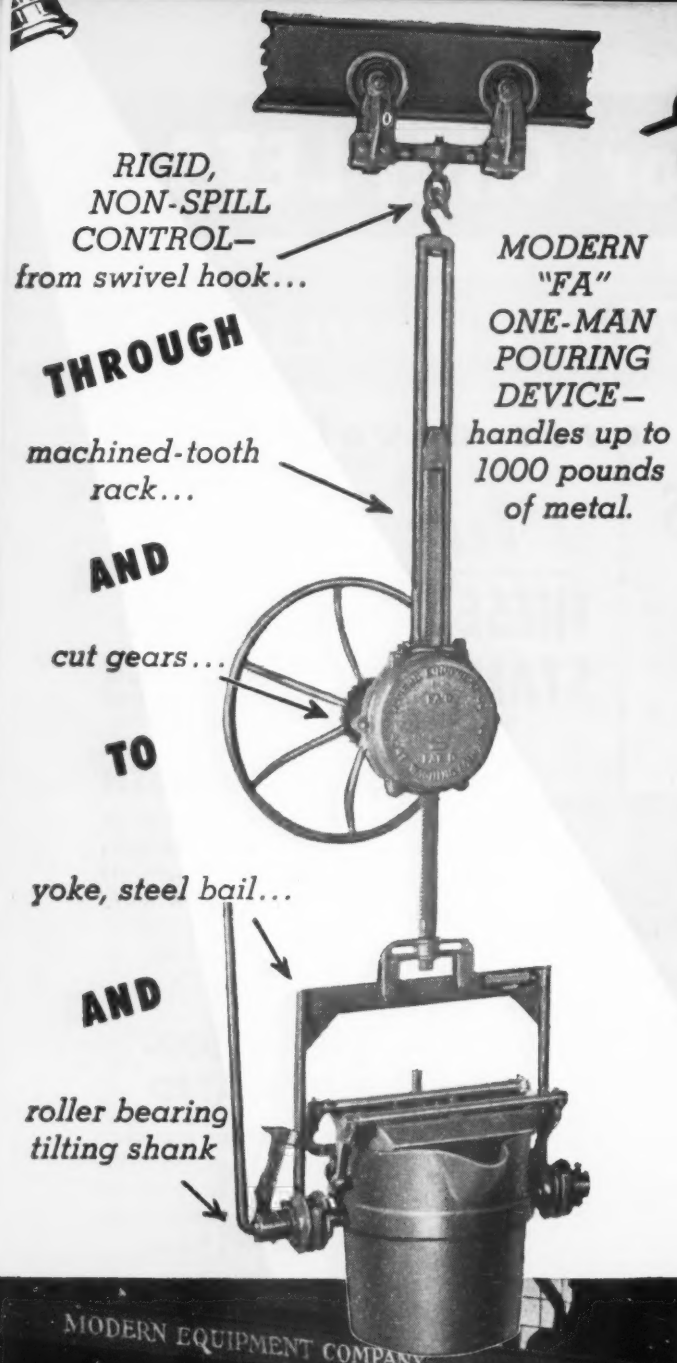

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